Engineering News-Record

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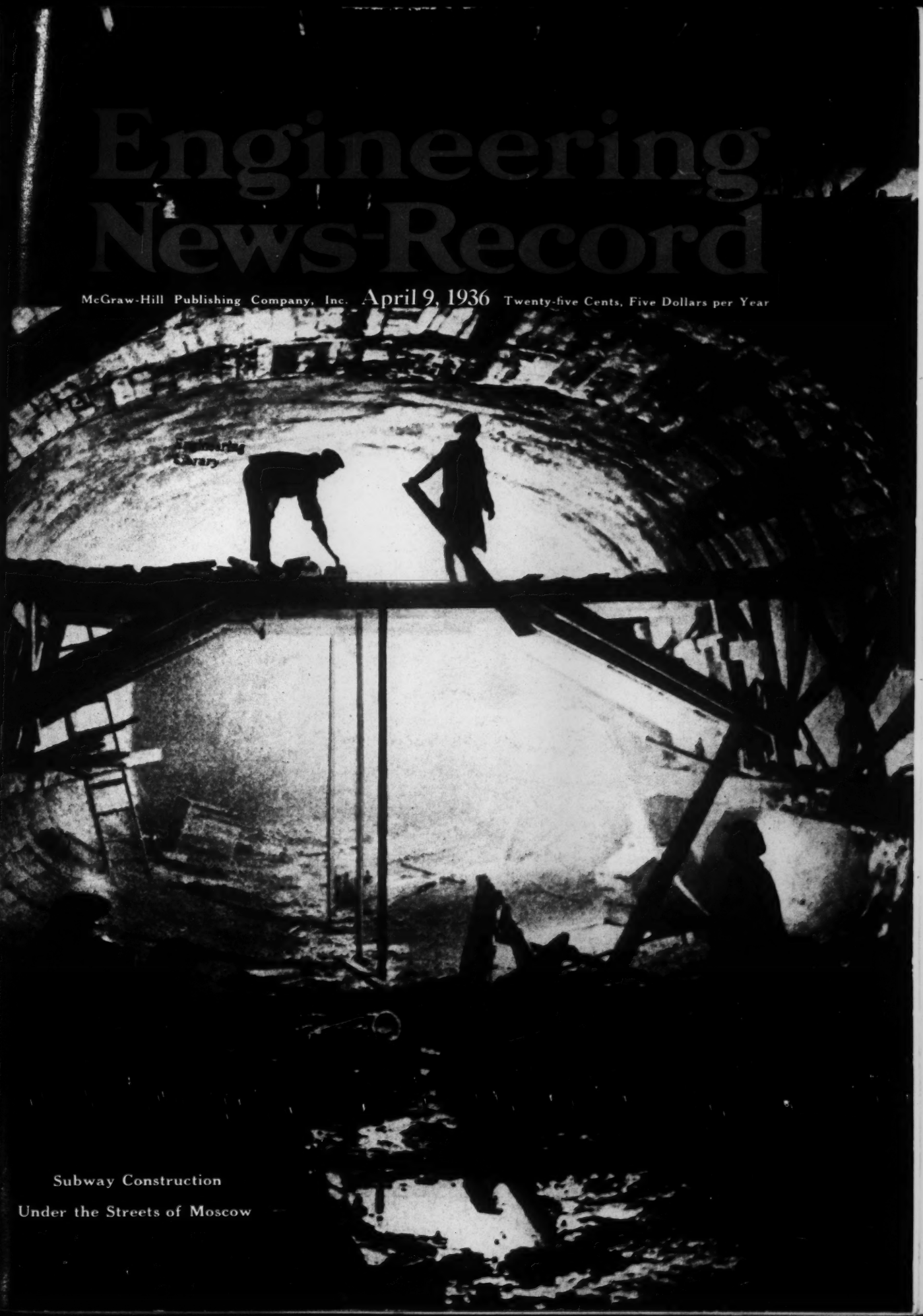

Subway Construction
Under the Streets of Moscow

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A MOMENT WITH THE PUBLISHERS

An Evil that Feeds on Itself

NO SOUNDER brief in defense of private enterprise against the encroachment of government competition has yet come to this writer than that released by Major George L. Berry, Coordinator of Industrial Cooperation, in the report of his Committee on Government Competition with Private Enterprise.

Although less wordy and rhetorical than some of the more pretentious platforms and pronouncements that have been uttered on the subject, this report none the less impressively and incisively marks out the legitimate domains of private and governmental enterprise as these are implied by our present system and, indeed, as they must be maintained if that system is to survive. In its very succinct and unemotional brevity it emphasizes the intrinsic weight of its substance.

PARTICULARLY noteworthy are the statement that "the government's function is to protect and promote the economic activities of its citizens, not to supplant them," and the reminder that the inevitable effect of expanding governmental activities into the field of productive business and industry is "to increase governmental expenditures while decreasing tax revenues and to dry up the sources of government income."

No less important, and the more striking because it is so seldom emphasized, is the observation that such filtration of government into the field of business activity inevitably feeds on itself; each step invokes still another until, in the phrase of the report, "once embarked upon this course, the government is placed in the difficult position of having either to absorb the functions of private enterprise which its competition has destroyed or to withdraw completely from the devitalized fields of private activity." Herein the committee illuminates a truth that is obvious to everyone who must cope with governmental invasion of business. Suspension or curtailment of any such activity always is difficult: to the governmental employees involved, their jobs are at stake; to the legislators and officials from whom a remedy must be sought, those jobs are an important factor in their political patronage. "Any activity once introduced into the government," says the committee, "inevitably tends to expand to larger and more formidable proportions."

Construction men will consider it quite appropriate that their industry should be cited as an outstanding example of governmental filtration into private business. The report thus cites construction not only because of the size and scope of the industry itself but also because of its far-reaching influence on many dependent industries which involve so widely diversified an employment of both labor and capital: these range "from the professions of design and supervision, through the various skilled trades and construction arts, to the unskilled labor on the work, and from there to the factory, mill, forest and mine for the procurement of materials of construction."

Under cover of emergency activities, created to absorb the unemployed of many callings, government consistently has edged a variety of public agencies into the construction business and elbowed out those construction organizations and workers which normally would prosecute the public construction of the country. This is despite the announced intention of the administration, as embodied in the work-relief acts, to use to the maximum the facilities of private enterprise. Many business men hitherto have seemed to view complacently this encroachment upon a field of private enterprise other than their own. But it is quite possible that organized business might take a keener interest in the situation if government were to invade every field of industry to create a job for each unemployed worker at his own calling rather than, as now, wish them all on the construction industry.

TODAY it appears that, unless the construction industry can make itself heard and felt in Washington, this governmental invasion of the construction industry may be expanded rather than contracted; such a threat would be implied by any suspension of the PWA activities through which private enterprise now derives so much of its employment on public works.

That, however, is another story. Here and now, the purpose is to note and acknowledge the substantial service rendered to private enterprise in general and to the construction industry in particular by Major Berry and his committee in thus pointing out so clearly the inevitable outcome of increasing governmental competition with the private enterprise on which government must rely for its revenues.

Willard Chevalier

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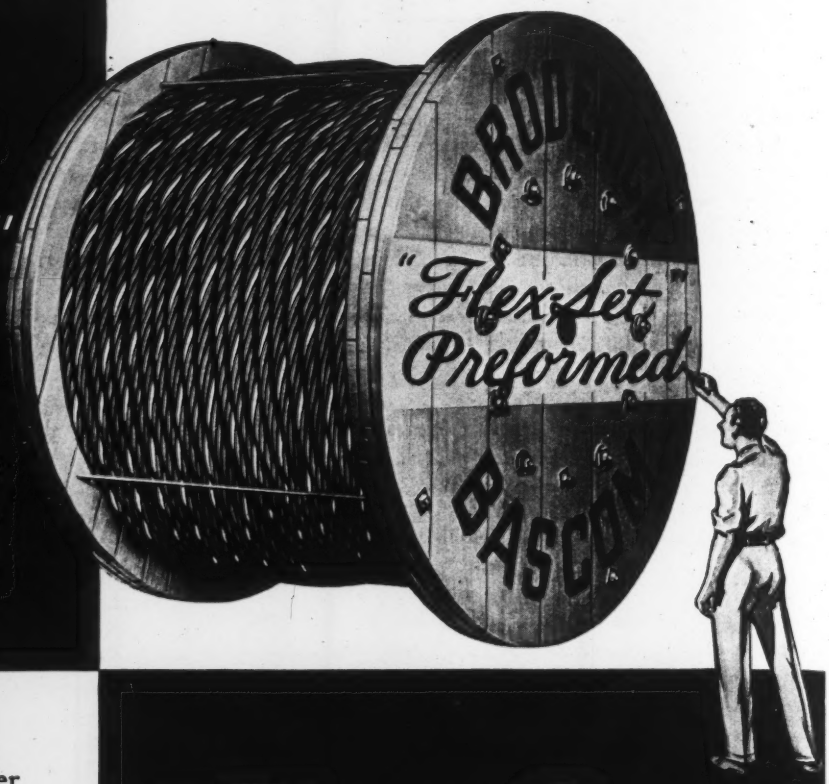
The "LAST WORD" IN WIRE ROPE



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John F. Stevens' Recollections Reprinted

ACTING on the suggestion of many who found pleasure and inspiration in reading the series of recollections of John F. Stevens, published in *Engineering News-Record* last year, the series has been reprinted in book form. The book contains the thirteen articles written by Mr. Stevens and a brief review of his career.

AN ENGINEER'S RECOLLECTIONS—By John F. Stevens. Paper boards, 6x9 in., pp. 80, halftones and line drawings. Published by *Engineering News-Record*, 330 W. 42d St., New York, N. Y. Price $1.

Los Angeles street showing Atlas White Traffic Marker after three year's wear. Marker installed by Inlay Marker Co., Long Beach, Cal., under supervision of the City Engineer, Los Angeles

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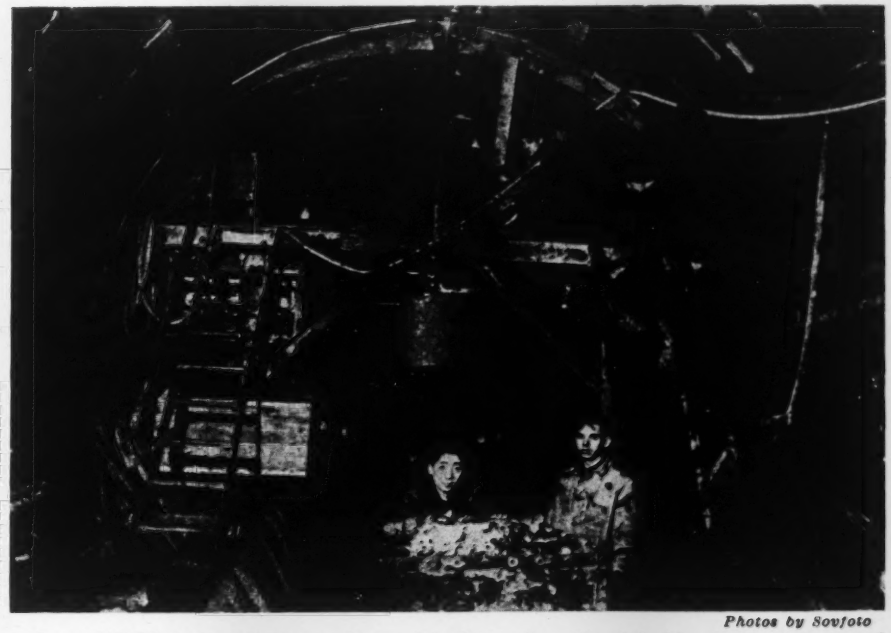
ATLAS WHITE TRAFFIC MARKERS

ENGINEERING NEWS-RECORD

April 9, 1936



Photos by Sovfoto

FIG. 1—SHIELDS constructed only a small part of the first 7-mile section of the Moscow subway but proved so efficient that 26 have been ordered for future work.

The Moscow Subway

A finer underground railway, constructed faster in more treacherous ground by more versatile methods is Russia's challenge to the world's subway builders

By I. Gutmann

Associate Editor, Engineering Index Inc., New York, N. Y.

THREE YEARS AGO the Soviet government of Russia began the construction in Moscow of the proposed "finest subway in the world." On May 15 last year seven miles of this underground passenger railway was put in operation. The remarkable rapidity of construction in treacherous ground was accomplished by exercising unusual versatility in methods.

This first article, by Mr. Gutmann, is a factual description of structure and construction methods. The second, by Mr. Pinco, gives figures of employment and output of work and describes stations, tracks, cars and train operations. Together these articles give engineers the most complete narrative in English of this first experience of Russian engineers in subway construction.

THE CONSTRUCTION of the first seven miles of the Moscow subway is of great engineering interest. Although the completed line is only a fraction of the projected 50 miles of underground rapid-transit railway for the Soviet capital, the conditions of construction are generally indicative of those throughout the work. Beginning with limited experience, the Russian engineers developed a technique that gave noteworthy results in rapid construction. Some of the methods developed were unique. It is, however, in their aim to build the finest subway yet constructed that the directors and designers feel that they have succeeded best. In proof they emphasize the following particulars:

1. The curves and grades are exceptionally easy; the shortest radius of curve, with one exception of 394 ft., is 656 ft., compared with 246 ft. in Paris and 213 ft. in New York. The maximum grade is 3.33 per cent in Moscow, 4 per cent in Paris and 4½ per cent in New York.

2. The tunnel sections are large: 18 ft. in Moscow, 17 ft. in New York and 11.8 ft. in London.

3. Twelve of the thirteen stations are on tangents; other subways have frequent stations on curves; at Paris there is a station on a curve of 245-ft. radius.

4. Station platforms are wide, and nearly all are island platforms; the Moscow platforms are generally 26 to 49 ft. wide, and one is 72 ft., but none is less than 13.1 ft. wide; in New York the minimum width is 11½ ft., and in London and Paris about 5 ft.

5. Stations are large; the length generally is not less than 505 ft.; the largest, Okhotny Ryad, is 558 ft. long, 112 ft. wide and 43 ft. high.

6. All deep-level stations (52 to 115 ft. below ground surface) have at least one triple set of escalators totaling 26 ft. in width; the Okhotny Ryad station has three escalators at each end, and the

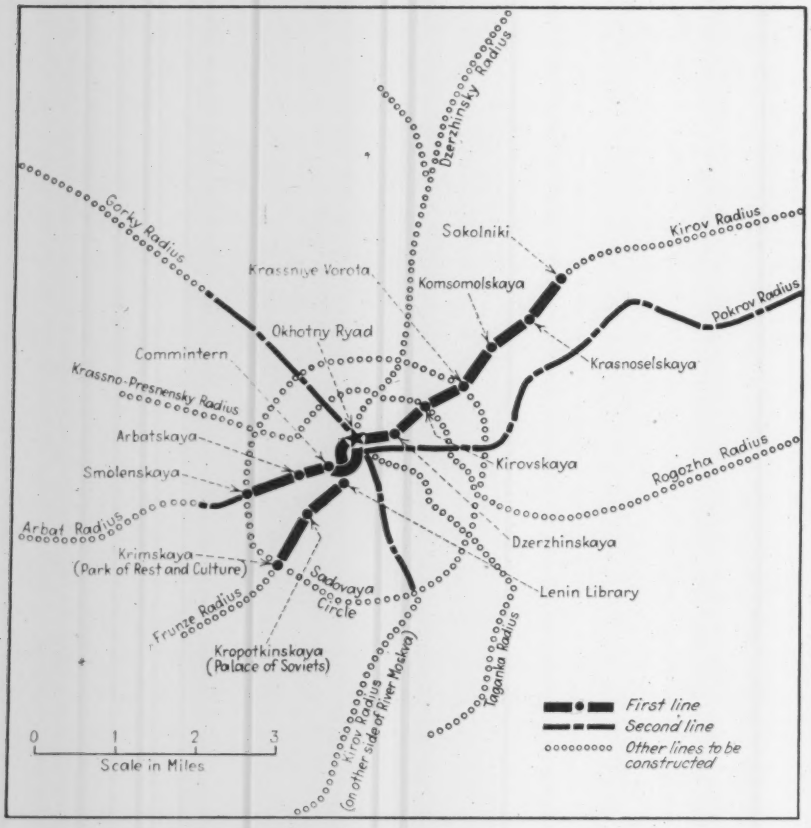


FIG. 2—SCHEMATIC PLAN of 50-mile Moscow subway, showing proposed order of construction; first line was opened for operation in 1935.

Kirovskaya station has escalators 105 ft. high on a 30-deg. incline that are claimed to be the longest ever installed.

7. Artificial ventilation is provided for the entire line instead of for stations only; the air is changed and ozonized eight to nine times an hour and is probably more pure in the subway than in the street above.

8. The track, except on the sharper curves and steeper grades, has heavy rails 246 ft. long with welded joints; judged from limited experience in Boston, Philadelphia and London this should give less noise, smoother riding and cheaper maintenance.

9. No subway has been so lavishly decorated; no two stations are alike, and all are finished in polished marble and granite; they are decorated with tile mosaics and with statuary and are brightly lighted with ornamental electric lights giving a ligh intensity of 50 to 100 lux; a high standard for other subways is 25 lux.

Even more than in these structural merits perhaps, the Moscow subway builders take pride in the quick handling of large volumes of work. The principal quantities were:

Excavation, cu.yd.	3,020,000
Concrete, cu.yd.	1,115,000
Waterproofing, rolls	305,000
Tunnels, lin.ft.	54,080
Track, miles	16
Stations	13
Marble facing, sq.ft.	226,000
Ventilating shafts	56
Electric wiring, miles	337
Four stations, kva.	14,800
Eleven transformer stations, kva.	18,000
Labor to March 1, 1935, man-hours	16,720,000

Practically 90 per cent of this work was completed in one year, 1934, when the employed force reached a peak of 75,600 persons, of whom 4,300 were engineers and technicians. This rate of construction—more than 6 miles in one year—appears truly unprecedented when it is recalled that seven years were taken to build about 13 miles of the Independent Subway System of New York, that the construction of the 2½-mile Tokyo subway took four years, and it is estimated that the 8½-mile Rome subway will take twelve years to build.

The labor force, which in 1934 averaged 65,000, was composed of men, women and youths all untrained in construction. Yet these workers accomplished wonders in production. And again, in spite of difficult conditions of excavation in treacherous ground, often in compressed air, the fatal accidents were only one per million man-days worked.

How the work plan grew

The present plan for Moscow subways dates back less than five years, but the idea had a much earlier origin and many vicissitudes before 1931. A plan for the construction of a rapid-transit railway was submitted to the Moscow municipality in 1902, about the time the first New York subway was started. The population of the city had then just passed the million mark. The Tzar's Archeological Society of Moscow pointed out with great indignation that the proposed route would touch the sacred ground of ancient cathedrals, and the Moscow Municipal Duma pronounced the plan "pernicious, unsanitary and immoral."

Several other plans were proposed at various times, but nothing was done

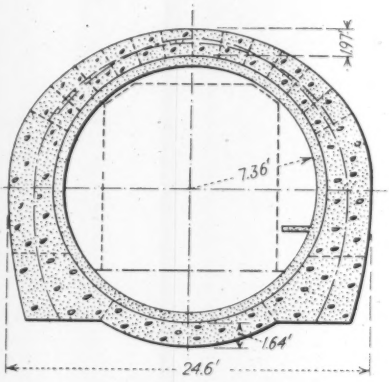


FIG. 3—ONE-TRACK circular tunnel constructed by the Belgian method, which found particular favor with the Russian engineers; inside diameter is 16.7 ft.

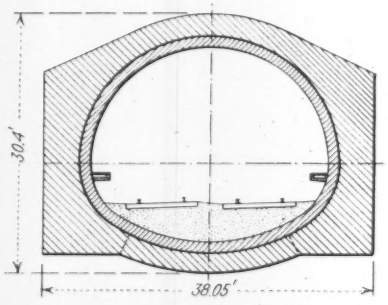


FIG. 4—TWO-TRACK TUNNEL built by the Belgian method, showing the practice on all tunnels of waterproofing inside by diaphragms protected by a reinforced-concrete ring; clear width is 27.4 ft.

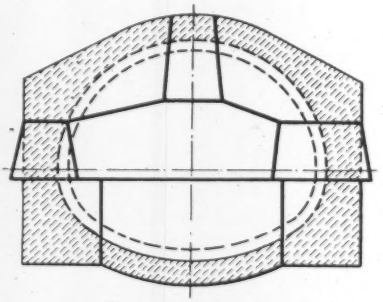


FIG. 5—MODIFIED GERMAN METHOD of tunneling in compressed air was used on a portion of the Kirov route.

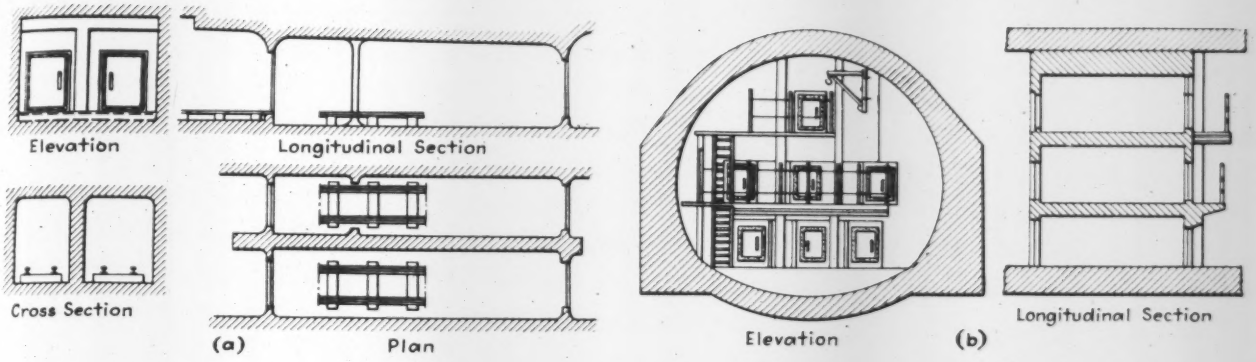


FIG. 6—MULTIPLE LOCKS were used on the compressed-air work on the Kirov route; all were constructed of concrete. Two types (a) and (b) are shown.

until after the revolution of 1917, when Moscow became the political and industrial capital of the Soviet Union and its population of 1,500,000 began to grow toward its present 4,000,000 at the average rate of about 150,000 a year. With only motor vehicles, streetcars and horse-drawn drozhki, the facilities for transportation were highly inadequate. Streetcar rides per capita per year were 520 in 1932 and 700 in 1933, compared with 390 in New York for all means of city transit; the cars were overcrowded by some 70,000 passengers per car per year in 1934. The necessity for an off-surface means of transit was realized as early as 1925.

In 1926 the German contracting firm Siemens-Bauunion of Berlin was engaged to make an engineering study of a 3-mile section of a proposed subway system. In June, 1931, the Moscow Soviet authorized construction, and in the plan announced by its chief, Lazar Kaganovich, prescribed: (1) the Moscow subway was to be the best in the world; and (2) its construction was not to disturb the functioning of the city streets, existing transit facilities nor public utilities. Construction was started by breaking ground in November, 1931, but little was accomplished until the spring of 1933.

The first 1½ years were a period of groping and fumbling in the field and of arguing and deliberation in the office. By the end of this period engineering exploration and industrial preparation back of the lines were completed, and the routes were definitely agreed on; the still irreconcilable expert opinions as to methods of construction were settled by a resolution of the central committee; the engineering organization was thoroughly revamped, and during 1933 about 10 per cent of the construction was accomplished. This did not meet the notions of speed of Kaganovich, and in the last week of 1933 he demanded radical acceleration of operations to complete the first program in 1934. Excavation was ordered to proceed at a rate five times and concreting from eight to nine times as fast.

In 1934 "12,000 yd. of excavation and 5,000 yd. of concrete a day" was made the slogan of a great mass movement timed to begin with the end of the first five-year plan when many laborers and engineers could be released for new tasks. Many thousands of volunteer workers were organized in "sabbath day brigades." Construction progress advanced rapidly, and in ten months trial runs were made over a part of the route; four months later the subway structure was completed; and on May 15, 1935, three months later, the subway was opened for regular operation. Immediate preparations were then begun to construct 13 more miles, to be completed in four years. The new line is promised to be even more luxurious than the present line.

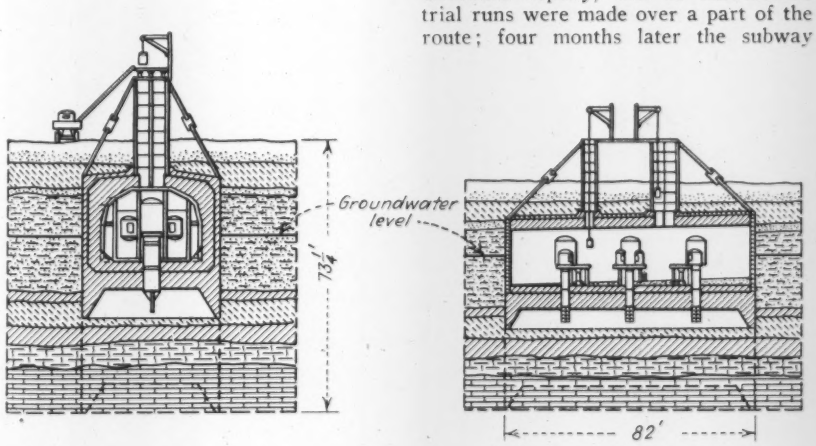


FIG. 7—THREE CONCRETE CAISSONS set 10 ft. apart, end to end, and sunk by compressed air were used for 266 ft. of the Kirov route.

Radial plan adopted

The radial street plan of Moscow indicated a radial plan for the subways to connect the outlying suburbs, industrial plants, parks and railway stations with the political and commercial center at the Kremlin. The map (Fig. 2) indicates the routing. The system consists of ten radial lines and a connecting belt around Sadovaya Circle and a sort of half belt of smaller diameter largely coincident with the Boulevard Circle and connecting the Krasno-Presnensky and the Rogozha routes.

As all of the land belongs to the state, there is no problem of property rights in line location. The routes are laid out solely in accordance with the most favorable topographical and geological conditions across city blocks or under street pavements as may be desired.

Turning to the particular routes considered at this time, they may be classified as three radial routes not extended to their ultimate terminals: (1) the Arbat radius, about 1½ miles long, leading southwest from the center of the city to the Smolensk Plaza; (2) the Kirov radius from Okhotny Ryad in the center of the city northeasterly to the Sokolniki suburb and park; and (3) the Frunze radius also from Okhotny Ryad southwest to the Park of Rest and Recreation at Krimskaya Plaza. The last two radii make up the Frunze-Kirov diameter.

Ground conditions hostile

When the vital problem of ground conditions came up for consideration, all experience as well as special borings up to 200-ft. depth indicated soils unusually adverse to underground work. Four buried channels of ancient rivers, soupy quicksand formations 60 ft. thick,

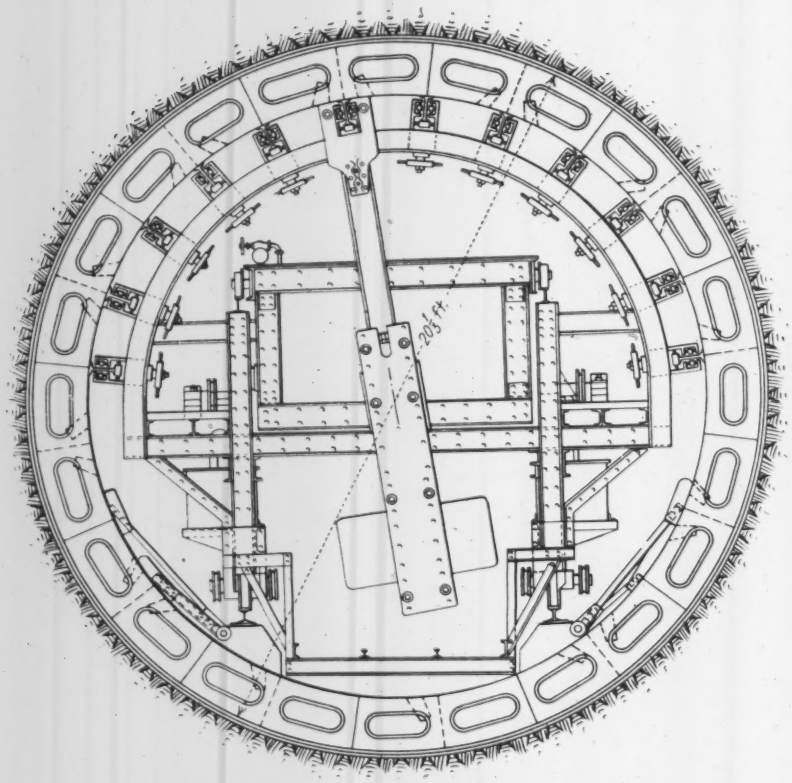


FIG. 8—SHIELDS had electric-power erectors to handle ten-segment concrete-block lining; this was the Russian-built shield.

swelling clays, four different geological formations converging on one tunnel, and very often radical changes in geological structure every 5 or 10 ft. were sufficiently deterring, but there were also innumerable subterranean passages of medieval times that had to be traced by a staff of archeologists, to determine how they should be handled.

Beginning with the present northeastern terminal, Sokolniki, there is a 2-mile stretch extending to the Krassniye Vorota station characterized by deep variable strata of stable limestone and clay crossed by the deep channels of three ancient streams. The upper ground consists principally of quaternary arenaceous clays and of water-bearing fine sands generally mixed with clay. At the southeastern end of this stretch considerable semi-liquid quicksand is encountered close to the surface. These conditions suggested shallow construction mostly by the so-called Berlin method with extensive groundwater control. Quicksand at the Komsomolskaya station was negotiated by means of steel sheetpiling.

Next comes a stretch about 1½ miles long, extending as far as the Okhotny Ryad station, characterized by rather thin strata of jurassic and carboniferous clays and limestones, at depths of about 50 to 120 ft., crossed by the Neglinka streambed and overlain with soupy quicksands, 40 to 60 ft. thick. The jurassic clay is a treacherous formation; when first exposed, it appears stable and requires only a little timbering, but within a few days it begins to swell, and it expands prodigiously. According to George Morgan, the American tunnel expert on the job, there were cases where 8x8 ft. timbered section, six weeks old, would be so choked by the swelling clay that a small mine car could hardly pass through them; 20-in. timbers would be broken like matches. These conditions dictated deep-lying tunnels, well below the quicksands and within the jurassic and carboniferous clays and limestones, constructed by mining methods and shield tunneling.

On the rest of the system—namely, the Frunze and Arbat radial routes—there are no jurassic clays but only quaternary deposits of sand and clayey sand, often saturated with water, underlain with carboniferous clays and limestones and occasionally crossed by buried ancient streambeds. These conditions indicated the adoption of open-cut construction. Most of the Frunze radius was built by the Berlin open-cut system, and practically all of the Arbat route was by the so-called Parisian trench system, except where passing across city blocks and congested traffic arteries imposed the use of the Belgian mining method and the Moscow trench method.

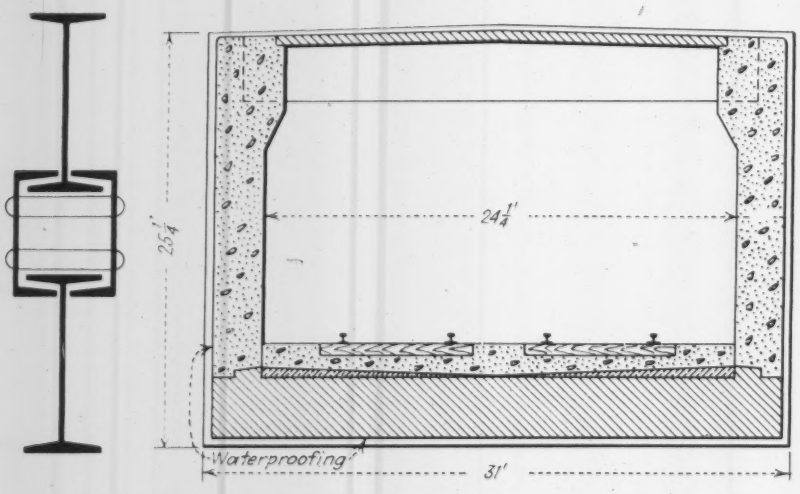


FIG. 9—SHEETPILING of combined channels and I-beams used in wide open-cut construction to hold sides of cut, also a section of standard open-cut subway.

Construction attack versatile

It will be recalled that in authorizing the construction of the subway one of the main provisions stipulated non-interference with the vital traffic of the city. Traffic considerations therefore played a governing rôle in deciding on methods of construction, and naturally underground processes of excavation were favored. The Berlin open-cut and the Parisian semi-open trench methods of construction were allowed only in outlying districts or on exceptionally wide thoroughfares that could be constricted without materially affecting the movement of traffic.

Of the total of more than 54,000 ft. of subway, 29,564 ft., or 55 per cent, were excavated by the Belgian mining method; about 2,910 ft. were constructed by shield and 262 ft. by pneumatic caisson; 10,666 ft., or nearly 20 per cent, by the semi-open Parisian trench method

(a considerable part of it by the so-called Moscow method, which is the Parisian method adapted to across-block, under-lot construction); and 13,846 ft., or about 25 per cent, by the Berlin open-cut method.

Open-Air Tunneling — In open-air tunneling by which more than half of the subway was constructed, both the Belgian and the American top-heading and bench, or flying-arch, methods were employed. The American method vigorously advocated by George Morgan was liked because of its economy, but preference was given to the Belgian method because it was familiar to Russian engineers. Both methods are familiar to American engineers and need not be described in detail. Fig. 3 shows a single-track tunnel section 18 ft. in diameter inside the structural lining layers of waterproofing and a reinforced-concrete protective lining reduce the diameter to 16.7 ft. net. Fig. 4 shows a two-track section of 27.4-ft. net maximum width.

German Method with Compressed Air—Two short stretches of the standard two-track section (Fig. 4) located between stations Komsomolskaya and Krassniye Vorota, totaling 633 ft., were built under compressed air by the somewhat modified German tunneling method, following the order of procedure indicated by Fig. 5. It was essentially the method of tunneling by mining under compressed air, with little timbering and no shield, similar to the scheme used in constructing a part of the Pennsylvania Railroad tunnels in Long Island City, N. Y., and the telephone tunnels of Chicago. Two types of lock design were used. Fig. 6a shows a concrete non-symmetrical double lock 22.5 ft. long and 6 ft. high, with two tracks for mine cars, and Fig. 6b shows a series of seven single concrete locks arranged in three tiers against a bulkhead built in a completed tunnel section. These locks, 16.7 ft. long, vary in height from 5.7 to 6.6 ft. The air pressure used was not over 30 lb., yet air leakage was very considerable, and free air had to be supplied at an average rate of 70,000 cu.ft. per minute.

Caisson Method — At the same locality a length of 266 ft. of two-track tunnel connecting the two short stretches just described was built by sinking caissons. The method was originally used some 30 years ago by the Metropolitain of Paris in building the subaqueous tunnels under the Seine and by the Hudson & Manhattan R.R. Co. in negotiating some crossovers and switch enlargements on the New Jersey side of the Hudson River tunnels.

Three standard double-track concrete sections, each 82 ft. long, 36 ft. wide and 36 to 39 ft. high, were built monolithically in pits 16 ft. deep. They were waterproofed around the outer periphery of the subway section, bulkheaded at both ends, encased in a concrete jacket nearly 12 in. thick, fitted out as pneumatic caissons with cutting edges, providing working chambers 7.5 ft. high, and equipped with triple air locks opening into the tunnel cavity, as shown by Fig. 7. They were sunk through fine sand, clayey sand and fragile limestone to grade, about 73 ft. below the surface, after which two 10-ft. connecting segments were built and the bulkheads removed. The groundwater level was about 32 ft. below the surface. Compressed air at pressures never exceeding 30 lb. was used only in passing the last 41 ft., and free air was supplied at the estimated rate of 8,800 cu.ft. per minute per working chamber. One caisson was built and sunk to grade in 36 days, about 1,420 man-hours per linear-foot of completed tunnel. The maximum lateral deviation from the theoretical tunnel axis was 5.43 in.

Shield Tunneling—Shield tunneling was taken up by the Russians with particular enthusiasm. It appealed to them first of all as the most mechanized method, and subsequent experience proved that it was also 70 per cent cheaper and about five or six times faster than the manual methods of tunneling.

In 1933, when the Moscow Soviet decided to introduce shield tunneling, very few Russian engineers had more than an elementary conception of the process, for it had never been used in their country. Foreign experts estimated that under the particularly unfavorable conditions of quicksand at the arch and limestone at the invert, the rate of progress would be from 2½ to 3½ ft. per day. An imported British shield, beginning operation in March, 1934, first advanced at the rate of 0.8 ft. per day, but within a few weeks it reached an average of about 6 ft. per day, and at the end of the job it attained a maximum of 15.2 ft. per day. The improvement in speed was due principally to three factors: (1) the reach of the propelling jacks was extended by wooden pads, thus increasing the maximum length of shove of the shield from 2.75 ft. to 4 ft.; (2) a bonus system of wages based on personal efficiency was established; (3) five-minute conferences were held at the end of each six-hour shift at which the crew discussed the work of the day and criticized it in a constructive manner.

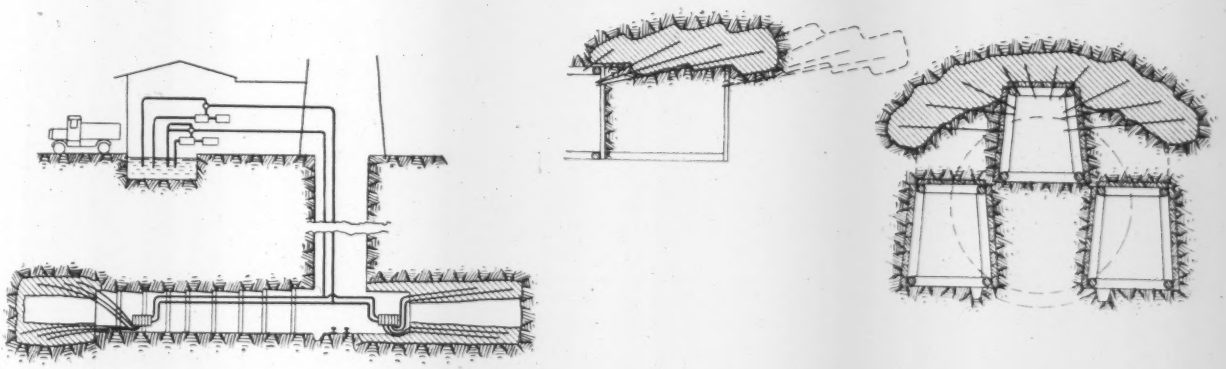


FIG. 10—QUICKSAND was solidified in shafts and tunnel by a chemical grouting developed by a commission of Soviet scientists.

The one other shield on the subway was of local manufacture; a product of 26 Soviet plants, it was made in five months and went into action six weeks after the British shield. Fifteen days were allowed to assemble the shield underground; the crew undertook to do it in thirteen days and finished it in twelve days.

The construction of the Soviet shield and its performance were not perfect; in fact, it was criticized in the local technical press, yet it did better than the British shield and its wear and tear were much less. This may be due to its improved original design featuring an entirely electrified erector; plunger pumps, supplying the hydraulic jacks, were operated by noiseless electric motors; unified control was centralized at one point, and welded construction of the shield skin was employed. The Soviet shield had a diameter of 21.5 ft. and weighed 132 tons. The weight of the erector was 44 tons. Fig. 8 shows the erector of the Soviet shield and also the standard shield-driven tunnel section lined with twelve semi-hollow precast concrete segments, weighing 3,300 lb. each.

The two shields, operating in pressures up to 35 lb. without serious accidents except for one fire in which 100 lives were endangered but none lost, accounted for less than 5.5 per cent of the first installment of the Moscow subway; but in the second and later sections they will play a dominating part. In preparation for this, 26 newly improved Soviet shields were ordered in 1935, to be ready in five months. Eight of these, with a diameter of 31.8 ft., are intended for station construction; two of these shields will have two erectors each. The lining of the future tunnels will be of cast iron.

Berlin Open-Cut Method—The open-cut method, used in Berlin and strongly advocated by the German consultants to the exclusion of all others, was used, as previously stated, on 25 per cent of the mileage, principally on the northeastern shallow half of the Kirov radius and on the Frunze radius. The sheetpiling was mostly wood, but occasionally a home-made compound pile of I-beams and channels, joined with gas pipes, was used (Fig. 9).

Excavation was mostly by hand and wheelbarrow. In frozen ground and in rock pneumatic drills had to be used. Toward the end, ¼-yd. and ½-yd. dragline scrapers were used with great success; power shovels found but little application.

Groundwater was controlled by the usual method: on some cases it was successfully drained downward into the underlying porous limestone, and the well-point drainage was also used. Metallic well-points were scarce, and the Russians improvised a wooden point consisting of hollowed wood trunks perforated with square apertures and wrapped in brass netting.

The standard double-track tunnel section constructed by the Berlin method is illustrated by Fig. 9. Concrete construction proceeded in this order: first the floor slab, next the walls, and lastly the ribbed roof.

Parisian Trench Method — The Parisian trench system of construction, used mostly on the Arbat radius, won great favor with the Russians because it interfered least with street traffic. The order of construction by this method is: first, two parallel trenches for the walls, next construction of the walls, then construction of roof and backfilling, after this excavation of the core under cover, and finally construction of the floor. The trenches were of one standard width of 6.56 ft., but their length varied from 40 ft., in open sandy ground to 10 to 20 ft. in congested places and to only 5 ft. when next to buildings.

Moscow Trench Method—The Moscow adaptation of the Paris trench method was devised for the construction of the Arbat route, 45 per cent of which is under occupied houses. Procedure by this method starts with two top-side headings, 6 to 7 ft. wide, from which pits, about 6.5x6 ft. in cross-section, are dug to subgrade and filled with concrete. For speed of construction the roof is made of heavy I-beams that carry traffic and other loads immediately. Thus the tunnel walls and roof are pieced together, then the core is excavated and the floor slab is poured. The maximum subsidence caused by this method of construction did not, as a rule, exceed 4 in. Much skill was required in handling old buildings. As a rule, tenants stayed on during construction; only in rare cases was it necessary to remove them temporarily. A few old houses of weak construction had to be demolished.

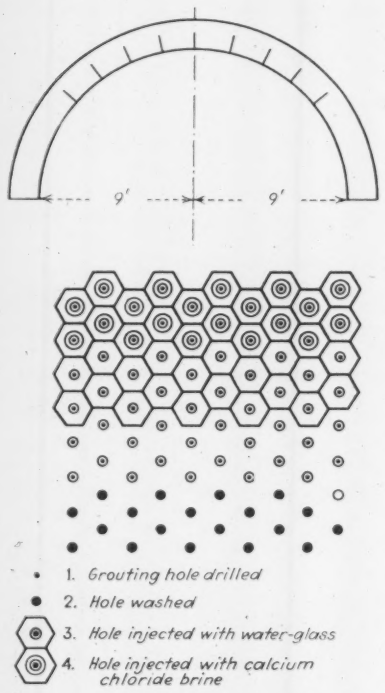


FIG. 11 — LEAKING TUNNEL ARCH was made tight by densifying the porous concrete by chemical grouting.

Ground solidification widely used

All these forms of construction required on frequent occasions solidification of the ground by freezing or by chemical grouting. Freezing, with calcium chloride brine at 15 deg. F. and 45-lb. pressure, was tried out in sinking shaft "20 bis" in March, 1933. A shell of frozen ground more than 3 ft. thick was frozen, and inside it a shaft, 16.4 ft. in diameter, was successfully sunk through 56 ft. of wet quicksand in 50 working days. Following this satisfactory experience, the process was applied in excavating the inclined escalator shafts of the deep-level stations. The brine pipes for shaft 20 were spaced around the circumference about 3.3 ft. apart. The air temperature within the shafts was generally around 18 deg. F., and electric heating had to be used in constructing the reinforced-concrete shaft lining.

Solidification of quicksands by chemical grouting was first thought of by Soviet engineers in 1929, in connection with coal-mining operations in the Moscow Basin. According to L. Lopatin, the German firm controlling the Joosten process of chemical grouting quoted a price of about $18 per cu.yd. of solidified ground but refused to bid on the particular job on hand for the reason that physical conditions were too unfavorable. The Soviet government then appointed a joint research committee, headed by Rzhanitzin and representing eight leading scientific and engineering institutes of the coutry, and within three years an original Russian process of chemical grouting was developed.

The grouting process starts with an injection of waterglass followed by a brine of calcium chloride or common salt, sometimes with cement. The quicksand solidifies as a shell more than 3 ft. thick within 15 or 20 min., attaining a crushing strength of 280 to 850 lb. per sq.in., or even 3,600 lb. per sq.in. when the quicksand abounds in quartz. The chemicals are injected with ordinary grouting pumps, through 1-in. pipes, 15 to 30 ft. long, perforated with 0.08-in. holes. The dosing has to be fairly accurate, and the flow is controlled with meters. The arrangement of grouting apparatus and piping is shown by Fig. 10. It generally took about 90 gal. of chemicals to solidify 1 cu.yd. of quicksand, and the rate of progress was about 2½ cu.yd. per hour. The costs generally amounted to a small fraction of the German firm's quotation. The process has been used with signal success on foundations and on quicksands encountered in shafts and tunnels, and also for waterproofing poor pervious concrete. Thus, the 2-ft.-thick concrete lining of the tunnel arch at shaft 19, which had been found to leak at the rate of 0.5 gal. per sq.ft. per 24 hours, with consequent leaching out of lime, was made entirely waterproof by chemical grouting. The arrangement of the grouting holes and the sequence of operations are shown by Fig. 11. The grouting holes, 1½ to 2 in. in diameter, 12 in. deep, were spaced in staggered rows, each hole commanding an area of about 3 sq.ft. They were first washed with a hot (about 160 deg. F.) 0.5 per cent aqueous solution of waterglass forced in under a pressure of 70 to 100 lb. Next, they were injected successively with nearly equal volumes of waterglass and calcium chloride brine, under a pressure of 70 to 90 lb. Washing and injection would be stopped only when the pumped-in liquids appeared in adjacent holes. It took 10 to 70 min. to grout one hole, and chemical solutions were consumed at the rate of 1 to 10 gal. per hole.

Concrete mixed locally

At the usual speed of construction and with concreting operations going on simultaneously at more than 100 points,

central production of ready-mixed concrete would be obviously appropriate. It was tried but had to be given up soon for lack of proper transportation facilities, and concrete was mixed simultaneously at more than 30 locations along the subway lines.

There was no oversupply of good aggregate materials, and, according to I. Falkov, some of the gravel had to be brought from a distance of 100 miles and more. Mill certificates overrated the quality of the puzzolana and portland cements used, and a vigorous system of inspection and double and triple testing had to be in operation 24 hours of the day. With all this, perfectly satisfactory concrete of these three classes was produced:

Class	Lb. per Sq. In.
A. For roofs and arches	1,560 to 2,420
B. For side walls	1,280 to 1,850
C. For floors and inverts ..	925 to 1,560

The cement content varied from a minimum of 420 to 590 lb. per cu.yd. In winter, with temperatures as low as —35 deg. F., the aggregate had to be heated. With maximum watertightness in mind, the water-cement ratio was limited to a range of 0.55 to 0.65. Factors of safety for reinforced concrete ranged from 2.5 to 3, and for plain concrete from 3 to 5.

It is estimated that over 25,000 cu.yd. of concrete were placed with electric heating, practically all of it within structures where winter temperatures prevailed even during summer months—i.e., in shaft "20 bis" and in the inclined escalator shafts that were constructed by the freezing process. The principles of the method were described in *Engineering News-Record*, Feb. 21, 1935, p. 286. The elaborate technique developed and results of tests form the subject of a book by A. Rethy who was in charge of this work. The 1½-ton precast reinforced-concrete blocks used in lining the shield-driven tunnel were also manufactured by electric heating with frame electrodes.

Extensive experimental research was conducted on waterproofing, vibrating and chemical grouting of concrete as well as on many other allied problems. Calcium chloride was found to be the best waterproofing admixture. Exceptional pains were taken to secure a diaphragm waterproofing as nearly perfect as possible. Coal tar mixed with asbestos proved to be of no value. Use was made of various bituminized textile fabrics. At first there was a tendency to be slack in the manufacture and application of waterproofing, and the strictest supervision had to be established. Specifications, which in the Soviet Union have the full force of law, demanded quality certificates, proper storage of roofing rolls in a vertical position, bitumen application at a temperature not less than 320 deg. F., 4-in. overlap at joints, thorough cleaning and drying of surfaces to be waterproofed, and so on.

Sections built by the open-cut and by the trench methods carry their waterproofing on the outside perimeter, while tunneled sections have their waterproof lining on the inside. In either case the lining generally consists of four or five layers, ruberoid alternating with pergamin, all impregnated and heavily coated with hot bitumen. The waterproofing is laid on a carefully prepared surface twice coated with cement mortar, cleaned and dried, and is jacketed in concrete. Inside tunnel waterproofing is protected with a dense reinforced-concrete lining about 8 in. thick. The concrete jackets are sometimes grouted with cement.

Administration of work

Lazar Kaganovich, who initiated and administered the project, took a very active part in all phases of planning, organization and construction. P. P. Rottert, of Dnieprostroy fame, was chief of construction, George Morgan of Detroit acted as chief consultant on American engineering practice, and F. Barret on British shield tunnel practice.

The information presented in this article was obtained in part through personal interviews with engineers of Metrostroy (the government trust in charge of subway construction and operation), but mostly from reports and papers by L. M. Kaganovich, P. Rottert, G. Morgan, G. Lomov, A. Rethy, I. Falkov, Goertz, A. V. Belyayev, Y. Tyagnibeda and many others. For assistance in obtaining information the author is also indebted to G. P. Brailo and M. Holtman, of the Commissariat of Heavy Industries, B. Levine, formerly of Metrostroy, and J. Finger of Inreklama.

Highlights of Moscow Subways

Rapid construction, large and luxurious stations, superior lighting and ventilation and commodious cars surprise the traveler

By C. N. Pinco
Civil Engineer, New York, N. Y.

DIFFICULTIES of construction and details of how they were overcome, vital to the understanding of the engineer, provide the layman with a poor picture of the Moscow subway. The magnificent response of labor to the call for rapid construction, the beauty and convenience of the stations, the cars and track, and the cost of all these are the facts that interest the man on the street. They are told here as they were observed and recorded during the two visits to the Soviet capital while the subway was in the process of being built.

The stupendous figures of employment are perhaps the first facts that astonish one. Organizing these thousands into a trained working force presented a problem made more difficult because management and direction had only just passed through the struggle of getting organized.

Without any previous experience in building subways—for this is the initial venture of its kind in the U.S.S.R.—the undertaking was begun without an experienced staff and without suitable mechanical equipment. There was no time

FIG. 1—THREE-FLIGHT reversible escalator leading from surface vestibule to platform of Krasniye Vorota (Red Gate) station 140 ft. below the street. The flights are 200 ft. long.

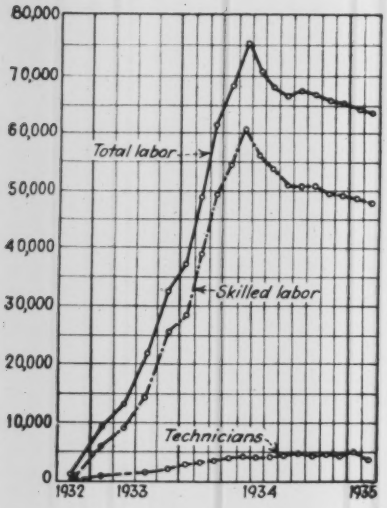


FIG. 2—RAPID INCREASE in employment to a peak of 75,600 persons in May, 1934, to meet the rush order for completion in twelve months.

to train a competent technical staff, nor could competent men be drawn advantageously from other parts of the country, where monumental projects were then in the process of construction. For two years the subway projects made very little advance of the kind that could be indicated on a progress chart. The years 1932 and 1933 were critical times in the fruition of the heavy-industry program of the state, which called upon its available engineering talent to achieve the five-year plan. But when 1933 saw this plan completed, it released an appreciable amount of engineering talent that was competent to assume the responsibilities of assisting in the construction of the Metro from the plans and subsurface explorations developed by the Soviet engineers and their foreign specialist consultants.

Labor was then called on to do its part, and the official record of its mobilization in numbers and volume of production is shown by the graphs, Figs. 2 and 3. These figures indicate only a part of the story. While the official records show over 75,000 workers at the peak in May of 1934, it is generally reported that a vast amount of free labor from such sources as the youth organizations, factories en masse, schools and other groups was given voluntarily as a patriotic duty toward the completion of this undertaking. It has been stated that nearly one-third of the entire population of Moscow had at one time or another participated in the physical labor of building the Metro, of which they are now so proud. It is interesting to note that this effort was made upon what is locally termed "free days" and as individual contributions to a state-created enterprise in which these participants were to have a common ownership.

Besides giving enthusiastically the work of their hands, Russians take justifiable pride in the fact that all of the materials and machinery, with the exception of one English tunneling shield, were supplied by Soviet engineers and factories. Much of the equipment involved manufacture by complicated processes. Among these items were the signal and block systems, motor compressors, escalators and tunneling shields; only in the beginning was the assistance of foreign specialists deemed necessary to advance the project. Two mechanical plants were set up specifically in connection with this project; one was for cutting and polishing marble and the other was for the production of bars for reinforced concrete. For the workmen 350 housing units (barracks) provided quarters for 49,800 people, and in addition there were 84 auxiliary buildings consisting of clubs, schools, laundries, hospitals, etc.

Station luxury emphasized

The attention of the stranger traveling by the Moscow subway is first at-

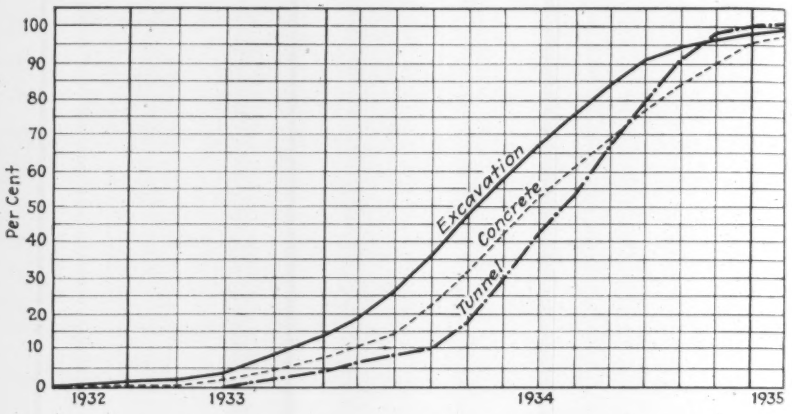
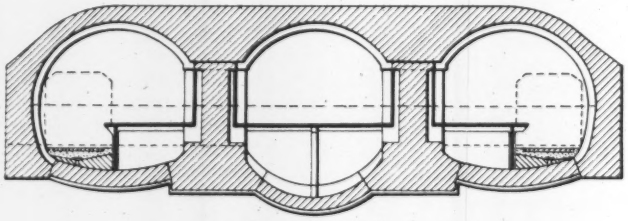
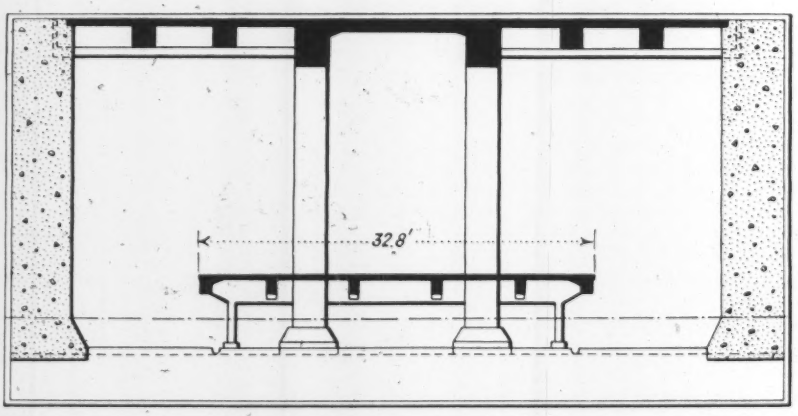


FIG. 3—PROGRESS CURVES of three main items of work show the extraordinary increase in production in 1934.



Cross-Section of Deep Station



Cross-Section of Shallow Station

FIG. 4—TRANSVERSE SECTIONS of shallow and deep stations show the characteristic roof support and island platform of the standard construction.

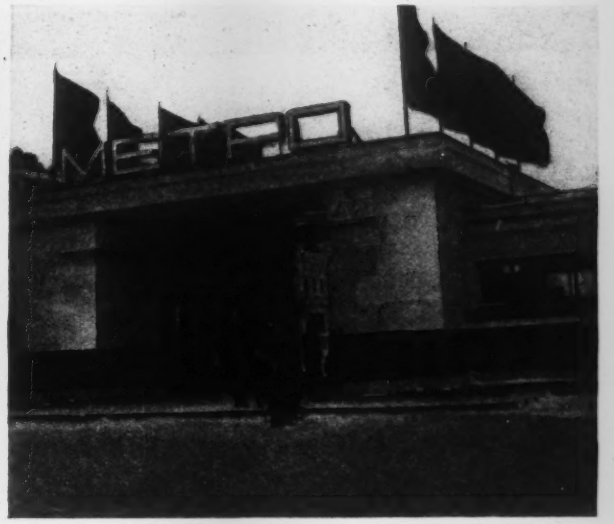


FIG. 5—ENTRANCES to the Moscow subway are of the vestibule type, forming complete enclosures from storm and snow, and are heated. The designs are all different.

tracted by the luxury of the stations. The accompanying views indicate design, materials and decoration as well as may be, but the camera tells little of the light and color and the clean air.

There are thirteen stations on the seven miles of subway. Because of the inclement weather and heavy snows, all stations have vestibuled entrances (Fig. 5). Instead of the usual kiosk entrances found elsewhere, the Soviet engineers planned rather pretentious entrance pavilions; like the interior station layouts, each is different in pattern. Of the thirteen stations, four are located between 52½ and 115 ft. from street surface to platform level, while the others range in depth from 23 to 29½ ft.

The general scheme of station design is that shallow stations have flat roofs supported on columns as shown by Figs. 4 and 6, and in some instances single-arch roofs; the deep tunnel stations have double or triple-arched roofs (Fig. 7). Most of the stations have island platforms; added stairways are located at such places as parks and railway terminals. The platform widths are usually 33 ft. with the exception of the Lenin Library station, which has a 26¼-ft. platform because of its single-arch roof. The three deep island stations have a triple-arch section with a platform spread of 69 ft., of which 42½ ft. are used for a center vestibule and escalator base, leaving a 13-ft. landing platform on each side.

To reduce the contrast between bright lights and the darkness of the subway and to eliminate glare, indirect lighting is used very effectively. The result is soothingly pleasant. It is claimed that there is a light norm of 50 lux, as compared with an average foreign practice of 25 lux.

At the risk of appearing exuberant, the writer is prepared to say that the Metro of Moscow is the most decoratively beautiful subway in the world today. The station columns and pilasters have a veneer of polished marble, which offsets the glazed-buff and white-tile wall panels. This ornate treatment was made at an estimated increase in cost of 200,000 rubles per station. Every station is unique in layout and color scheme.

For the 7 miles of subway now in operation there are 56 ventilating shafts. Of these, 30 are worked by natural and 26 by forced draft. The air provided per station and its adjoining section is from 300 to 340,000 cu.m. per hour for deep stations and 75,000 cu.m. for the shallow stations. Each linear-meter in the deep portion is furnished with 300 to 350 cu.m. of fresh air with eight or nine changes hourly. This compares with six changes for New York and five changes for London, hourly.

For the shallow sections of the subway, the 30 shafts are 3½x13 ft. in cross-section and are spaced from 328 to 394 ft. apart. The system of ventilating is reversible. In summer the average station ventilator provides 75,000 cu.m. of air hourly, and in winter it takes out about half that amount. The purpose of the diminution of air movement in winter is to maintain a more even temperature. The forced draft is supplied by a specially designed double-ventilating system in which the limiting tem-

FIG. 6—EACH STATION has an individual color scheme, style of decoration and light arrangement in marbles and metalwork of lavish design.

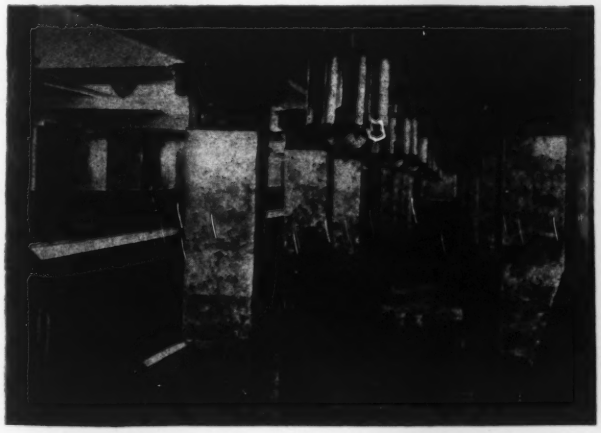


FIG. 7—LOW-LEVEL STATIONS with arched roofs lend themselves to particularly effective architectural design and coloring.

FIG. 8—TWO-TRACK TUNNEL SUBWAY shows neat finish of roof and walls and clearly lighted interior and tracks.

peratures for deep sections are fixed at +25 deg. C. in summer and at +10 deg. C. in winter. Special provision is made for ventilating the mechanical and sanitary equipment. Heat for all exit and station vestibules, which are provided with radiators, is furnished from a central heating station.

The drainage of the line is accomplished by nineteen controlling units, which force the sewage into the city sewers through automatic pump installations. Water is available only at the stations, and sanitary facilities are provided only at the shallow stations. The usual unit consists of two ejectors, a receiver and a compressor.

Track and rolling stock

The track shown in Fig. 8 is the 5-ft. gage prevailing on the Russian railway system. The ballasting method of New York City subways is used; tie spacing is 2,560 per mile on tangent and 2,820 per mile on curves. The rail corresponds to our 100-lb. rail designed for a 17.5-ton concentrated load; the ties are 6½ x 10 in. by 9.5 ft. long. At stations short ties are used, embedded halfway in concrete with the usual middle drainage trough. The rails are fused and copper-bonded. The conductor rails are of soft steel in 40-ft. lengths. The track along its entire length is provided with an autoblock system of 106 units.

The passenger cars, of the welded metallic type (Fig. 9); are about 62 ft. between axles, 9 ft. wide and 9 ft. high; they have four center doors, 4 ft. wide, automatic closing, and an estimated seating capacity of 52 passengers and a peak-load capacity of 170. The motor cars have four motors of 150-kw. capacity, auto-pneumatic brakes and electric heating equipment. The propelling unit consists of a driving motor car, weighing 45 tons, and an auxiliary car weighing 31.5 tons. Service was begun with a double section of four cars, but it is expected to attain a maximum train length of eight cars in the near future. The shops are located at the storage yard, where there is a provision for nine tracks, each good for an eight-car train. Shop facilities are available for the care of 160 cars yearly and for servicing the motor cars after a run of 31,000 miles, semi-annually, and the auxiliaries every 62,000 miles, or annually.

The escalators merit special mention because the Soviet engineers regard them as a pioneer achievement in subway construction. Requiring a bore of 66 ft. at an inclination of 30 deg. with the horizontal, these inclined tunnels (about 200 ft. in length) were driven by the use of the calcium chloride-molten glass process. These inclined shafts were designed to provide for triple-run reversible escalators to travel at a speed of 1.64 ft. per second with an estimated carrying capacity of 9,000 passengers hourly. At one station a higher-duty escalator traveling about 2 ft. per second accommodates 13,200 per hour, and one busy station (Okhotny Ryad) is provided with escalators at both ends of the station.

Plan of operation

The running plan contemplates a 3-min. headway, which will require fifteen trains in transit or a round trip in 50 min. between terminals, which can be reduced to 45 min. between the heavy traffic stations of Komsomolskaya and Krimskaya Plaza. As the station platforms are designed to accommodate eight-car trains, the maximum number of cars in use will be 120 with a maximum car capacity of 170 passengers for rush-hour traffic (estimated at 10 per cent of the 24-hour capacity). It is expected that in both directions 62,000 passengers can be handled hourly, with a limit of 620,000 per day, or 220,000,000 per year. It is estimated that the volume in rush hours is treble that of normal traffic.

On the basis of these figures the Soviet engineers compute that their system will have a traffic capacity 2½ times as great as has the Paris Métro; but it is only fair to note that it is yet much too soon to state what the actual conditions of operations in Moscow will disclose because the phases of seasonal traffic, novelty, etc., have not yet tested the continuity of traffic flow.

A maximum rate of speed of 33 to 37 miles per hour was designated, with station stops of 30 sec.; this makes it necessary to maintain 16½ miles per hour average speed with 5-min. terminal stops and a computed travel of 345 km. daily per car.

The station platforms are equipped with up-to-date lighting and direction

FIG. 9—WELDED STEEL CARS, with four doors and a seating capacity of 52, are 9 ft. wide and 9 ft. high.

FIG. 10—ONE of the more simple decorative schemes for a shallow-depth station with side platforms.

signals for the convenience of travelers more like the Paris Métro than the New York subway. For soothing light and controlled ventilation there is no underground transportation system in the world, in the opinion of the writer, that is comparable for comfort with the Moscow subway.

Some cost figures

The recorded cost of the first section of the Metro is 760,000,000 rubles, which amount it is impossible to convert precisely into its dollar equivalent, because of such practical considerations as the part of this sum that had to be paid on a gold ruble basis, thereby involving the question of its foreign currency exchange equivalent. It is now generally accepted that the internal purchasing power of the paper ruble currently used in the U.S.S.R. is valued in the approximate ratio of 20 to 1 gold ruble. So that omitting the relatively small portion of the total cost of 760,000,000 rubles, which covered the expenses of foreign specialists, imported material and equipment, the estimated dollar equivalent would figure 760/20, or roughly $40,000,000. A logical comparison is further complicated by the omission of such items as right-of-way, contractor's profits, legal expenses and other items that do not reach the financial importance in a communistic state that they do with us.

Directing personnel

Inception and fulfillment of this project are generally credited to the energetic guidance of the Central Committee of the U.S.S.R. under the leadership of Josef Stalin and his dynamic associate, L. M. Kaganowich (now Commissioner of Transportation), who devoted himself to the administrative details so effectively that the Metro became a serviceable reality in April, 1935. It was 1931 when he suggested immediately proceeding with the preparation of details for a Moscow "Metropolitan" as the principal means of a rapid and inexpensive transportation system for the inhabitants of Moscow so that the actual work would be under way in 1932. The result is a highly commendable piece of engineering work, one of the finest examples of the blending of utility and esthetics that it has been the privilege of the writer to see in any of the more advanced cities in the world.

In the acquisition of this engineering work, U.S.S.R. has secured an outstanding example of its kind, and the engineering staff that brought the project to a successful issue may well be proud of its accomplishment. Without detracting any credit from the energy put into this undertaking by such personalities as Josef Stalin and his administrative representative, L. M. Kaganowich, a tremendous share of the credit goes to Paul Rottert, the chief engineer, and his many loyal associates who, starting from "scratch" with no previous experience in subway construction, succeeded in evolving an excellent example of an underground railway, modern, comfortable and practical.

Pipe on Long Suspension Bridge Presents Novel Design Problem

Question has arisen as to what kind of pipe and what type of joint are best suited to maintaining dependable service in a 10-in. water pipe across a 2,310-ft. bridge span in which the expansion-contraction range will be as much as 42 in. and the vertical movement as much as 25 ft. This problem is before the San Francisco Water Department in planning for water service to the 1939 exposition through a main that is to be carried by that part of the San Francisco-Oakland Bay Bridge spanning the West Bay channel. In this crossing there are two 2,310-ft. spans and other shorter spans totaling 10,300 ft. between anchorages.

Originally the plan was to bring water to Yerba Buena Island on the rigid structure between the island and the mainland on the east side of the bay. Then the 1939 exposition was proposed, and in negotiations about it in the early stages the promise was made to supply Hetch Hetchy water to the fair grounds. This made it necessary to bring the supply from the San Francisco peninsula and hence across the long suspension spans of the West Bay Channel.

Probably the extremes in expansion and vertical displacement mentioned in the foregoing will not occur frequently, but because the bridge is designed for this range it is desirable that the pipe shall meet these requirements.

Timber-Truss Bridge and Dam Built by CCC Labor

Steel rods embedded in bottom chords act as bridge tension members; permeability of soil at dam site overcome by use of puddled clay material

By Frederick C. Holmes
National Park Service, Dept. of the Interior

A TIMBER-TRUSS BRIDGE and a drop log dam built by CCC labor in Windsor, Mass., employ careful workmanship and sound engineering principles in construction details. The bridge, with a 45-ft. clear span, utilizes steel rods for taking the tension in the bottom chords, while the dam, in glacial material, presented problems in abutment construction, which were overcome by riprap and puddled earth.

Made of peeled spruce logs cut on the site, the bridge has a width of 17 ft. and a rise of 10 ft. at the peak. Each truss is designed to carry a live load of 300 lb. and a dead load of 400 lb. per linear-foot, and a vertical load at the center of 6,000 lb. The bridge abutments are of rubble concrete faced with native stone. The bottom chords each consist of four 12-ft. logs, 16 in. in diameter, with the tension taken by two 1⅛-in. round steel rods embedded in the bottom of the members and anchored to the top chord. The top chords, which are 12-in. logs, support the bottom chords at the peak and half-way points by steel rods set into the sides of the 10-in. vertical posts.

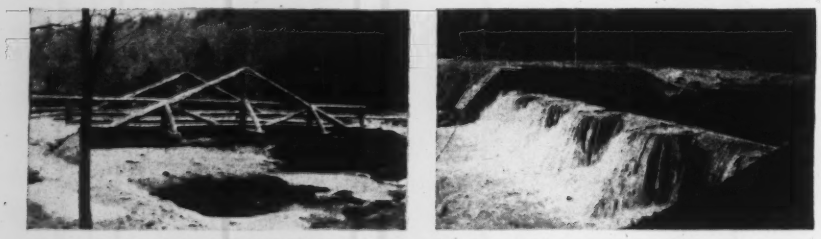


FIG. 1—TIMBER-TRUSS BRIDGE with steel rods as tension members, and drop-log dam built by CCC labor at Windsor, Mass.

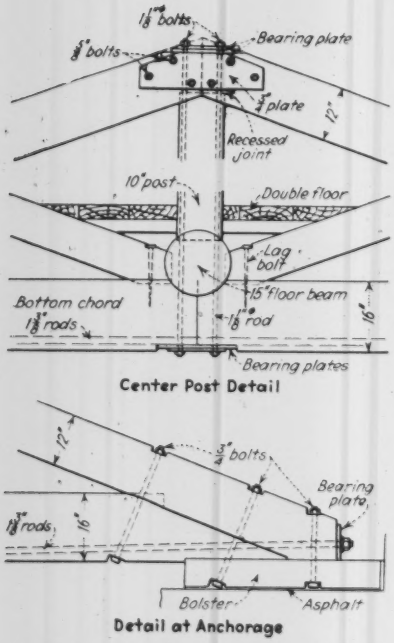


FIG. 2—STEEL RODS embedded in round spruce logs comprise tension members in timber truss bridge.

At the peak the top chords are joined by ¾-in. steel plates and on top by a bearing plate through which the vertical steel rods are fastened. These rods continue down the vertical timber posts through the floorbeams and bottom chord, where they are fastened through a bearing plate, thus supporting the bottom chord. Fig. 2 shows the detail of framing at the center post and the method of anchoring the bottom tension rods through a bearing plate on the top chord.

The floorbeams are 15-in. logs placed 4 ft. on centers with the beams at the bottom-chord joints extending 4 ft. outside the truss in order to support the lateral bracing. The floor consists of two layers of 3-in. planks, one course laid parallel to the length of the bridge and the other at an angle of 45 deg., in order to provide greater rigidity. All of the joints on the bridge were heavily asphalted, and the whole structure was soaked with clear creosote, in order to allow the bridge to withstand the weather.

Although large drawings were made of these joints for the framing crew, the framing of round timbers into a neat joint presented a rather difficult problem, and only the natural ability and interest of the specially picked crew made it possible to attain a finished appearance on the structure.

The log dam was erected across a stream that had a flow of 20 sec.-ft. during low water and as high as 15,000 sec.-ft. during the flood season. The stream carries considerable silt, and the drop-log type of dam was decided upon as making silt removal relatively easy. As the soil is glacial drift, considerable care was necessary in designing the abutment to prevent water from cutting around the edge.

The abutments were tied into the banks by excavating an area extending about 25 ft. from the abutment into the bank and running 50 ft. upstream. The excavation near the edge of the streambed extended deep enough to give a bond and then became shallower toward its other extremity. This excavated area was filled with a puddled clay material that was riprapped at the abutment site.

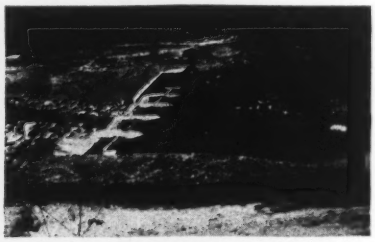


FIG. 3—DROP LOGS in masonry piers and abutments make silt removal easy at this dam.

The abutments are 55 ft. apart at the inside face and are separated by a series of four piers, 12 ft. on centers, with the openings between the piers cut off by removable, squared spruce logs. The piers are 17 ft. long at the streambed, 8 ft. 8 in. long at the top, and 5 ft. wide. The upstream face is pointed and protected from ice by a steel plate. The downstream face is semi-circular in plan. There is a 10x8-in. slot on the sides to receive the logs, and a reinforced-concrete cutoff wall, 2 ft. wide, on which the logs are seated extends between the piers. Timbers were native spruce, cut near the camp. The trees were felled as soon as the sap began to run, then peeled and allowed to season for about two months.

The two structures were built entirely by CCC labor from the Windsor, Mass., camp. Crews were specially picked from men who showed interest and ability in the work. Design and supervision were by the author in his capacity as superintendent of the camp.

Seven Years' Study Back of Twin Cities' Sewage-Disposal Plan

A design based on elaborate studies of river flow and oxygen balance is modified to take advantage of improved methods of sewage treatment selected for Minneapolis-St. Paul district

By Frederic Bass
Consulting Engineer and Head, Dept. of Civil Engineering, University of Minnesota, Minneapolis, Minn.

THE SELECTION and design of sewage-disposal facilities for the Twin Cities, where a 134-m.g.d. treatment plant and a 53-mile sewer system extension are now under construction, represent the culmination of many years of legislative attention and scientific investigation directed toward the abatement of pollution in the upper Mississippi River. The earliest general plans for the treatment works of the Minneapolis-St. Paul Sanitary District were prepared in 1928, but it was not until 1935 that a final general plan was adopted. This seven-year period has been one of more than usual rapid development in the science and art of sewage disposal, and during this time new or improved methods of treatment have been continuously appearing. Mechanical equipment for screening and grit removal have been perfected, and mechanically - cleaned sedimentation basins have almost entirely replaced Imhoff tanks. For secondary treatment, the activated-sludge process has displaced trickling filters, while under certain conditions chemical precipitation has been found more economical than either trickling filters or activated sludge; the use of shallow mechanically-cleaned filters has increased notably. Multiple-stage digestion of sludge, elutriation of sludge and vacuum filtration have been introduced and extensively used, and in the last year incineration of sludge cake has been demonstrated to be practicable.

The engineers associated with the Minneapolis-St. Paul project have made extensive inspection of works operating in the United States and have kept in close touch with changing practice throughout the period, with the result that general plans were continuously revamped to include more economical as well as adequate designs. The original plans contemplated the acquisition of perhaps 300 acres of land with the plant, exclusive of sludge-drying beds estimated to occupy about 45 acres; the final plan will take about 50 acres, and the works will cover about 15 acres. In 1928 the trickling-filter works which then appeared desirable were estimated to cost $14,000,000. Activated sludge later proved more economical and was estimated at $6,500,000 in 1933. The chemical-treatment works finally adopted will cost $3,000,000. Total annual costs show similar reductions.

FIG. 1—LOCATION MAP of Twin Cities, Mississippi River and treatment plant at Pig's Eye Lake.

General design data

The Minneapolis-St. Paul Sanitary District includes the Twin Cities and contiguous areas. The municipalities of South St. Paul and Newport contain packing plants of considerable size, which add materially to the pollution of the Mississippi River in the Twin City area and, while not included in the existing district, are required by legislative act to treat their wastes to "the same degree and extent" as does the Sanitary District within one year after the treatment plant of the Sanitary District is placed in operation.

The combined population of the Twin Cities in 1930 was 736,000. The 134-m.g.d. treatment plant is being designed on a 1945 basis when the population is estimated to reach 900,000; provision is being made for extension of the plant for 1970 requirements, when the estimated population is 1,100,000. The sewer systems of both cities are almost entirely of the combined type with an aggregate discharging capacity of 18,000 sec.-ft. The capacity of the main interceptor now under construction is 910 sec.-ft., and that of the treatment plant based on average 1945 sewage flow is 200 sec.-ft. Overflow at present sewer outlets will occur during storms, but all sewage arriving at the plant will receive treatment. The average flow in the river is 10,000 sec.-ft., varying from 800 to 100,000 sec.-ft. or somewhat more. Analyses of sewage indicate suspended solids of 185 p.p.m. and B.O.D. of 200 p.p.m.

Fig. 1 shows the two cities, the river and location of the treatment plant. At Hastings, Minn., 20 miles below the treatment plant there is a dam forming a pool extending above the plant.

Analysis of river flow from 1892 to date and of expected volume and strength of sewage indicated that plain sedimentation would be sufficient to give for 90 per cent of the summer months an average of 3.5 p.p.m. D.O. (dissolved oxygen) and a minimum of 2 p.p.m. D.O. in the Hastings pool and, because of aeration at the dam, a minimum of 3.5 p.p.m. below the dam. Although this pool is covered with ice in the winter months and its shores are sparsely inhabitated, consideration was given to the possibility of odors at the Hastings dam during this season as described below. Because secondary treatment is required for only a small percentage of the time and probably not entirely necessary for the next twenty years or more, a flexible type of treatment was indicated. Chemical treatment appeared to meet these conditions best and was adopted.

Historical background

The polluted condition of the Mississippi River at the Twin Cities has been a subject of discussion for more than 25 years. In 1923 the state board of health requested that the cities of Minneapolis and St. Paul remedy the condition, but no action resulted. The request was repeated in 1925, and a joint committee of the Minnesota and Wisconsin legislatures was appointed which, together with the city councils of the two cities, secured an investigation of the river by the U. S. Public Health Service. In 1926 a Twin City sanitary committee representing the city governments prepared a bill providing for state

legislation to create a Metropolitan Drainage Commission to study the situation. This bill was enacted into law in 1927. The Metropolitan Drainage Commission continued its studies until 1933 under the late James A. Childs, chief engineer, considering over thirty projects, with eight possible locations for treatment plants. They finally recommended an interceptor system with treatment plant at Pig's Eye Lake to be used jointly by the cities, the site of the treatment plant being 3 miles below the business center of St. Paul. Legislative acts were proposed in 1929 and in 1931 for the creation of a sanitary district including the municipalities of South St. Paul and Newport, where the principal industries consist of packing plants. With a population of only 15,000, these places contributed sewage with an equivalent load equal to more than 300,000 persons. The distribution of cost among all the communities concerned became a subject of controversy and delayed the creation of a district until 1933, when an act was passed which confined the district to the cities of St. Paul and Minneapolis and tributary areas.

The Sanitary District was organized in September, 1933. Its board of trustees was empowered by the law to construct a joint sewerage system and treatment works for the two cities. The law provided that each city should construct those works to be used exclusively by that city, and the facilities to be used in common should be built by the district. The reports of the Metropolitan Drainage Commission show that both Imhoff tanks and separate-settling and sludge-digestion tanks were considered for primary treatment, and both trickling filters and activated sludge plants for secondary treatment. Separate sludge digestion and activated sludge were finally recommended. Digestion of sludge with sludge-drying beds was included in all plans. The board of trustees of the Sanitary District tentatively adopted the general plans of locations of interceptors and treatment plant proposed by the Drainage Commission, and in the early part of 1934, in agreement with PWA, adopted a three-year plan of construction, the total cost of the project being estimated at $18,000,000. Actual construction on the joint interceptor began July 13, 1934, by which time the plant site had been definitely determined and studies of various plant designs continued.

In June, 1934, the PWA administrator requested the trustees to appoint an engineering board consisting of Brig. Gen. C. W. Kutz, Wm. N. Carey and Frederic Bass, to have final decision in regard to engineering on design and construction. This board took office in July and proceeded to review the work done to date on the entire project and to project the plans for the future. In October the board made a report to the trustees recommending chemical precipitation for secondary treatment as the method best adapted to meet the conditions. Its findings were accepted by the engineering department of the district and by PWA. On the request of this board the services of Greeley and Hansen, Fuller and McClintock and Consoer, Townsend, Older and Quinlan were engaged. Two of the three firms supported chemical treatment, and the board of trustees adopted that method of treatment in December, 1934.

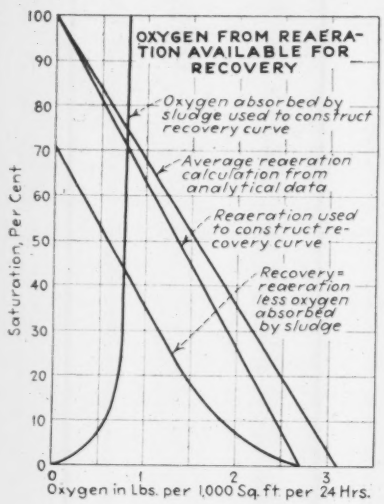

OXYGEN FROM REAERATION AVAILABLE FOR RECOVERY
Oxygen absorbed by sludge used to construct recovery curve
Average reaeration calculation from analytical data
Reaeration used to construct recovery curve
Recovery = reaeration less oxygen absorbed by sludge
Saturation, Per Cent
Oxygen in Lbs. per 1,000 Sq. ft per 24 Hrs.

FIG. 2—RATES of re-aeration of Mississippi River pool above Hastings Dam (20 deg. temperature).

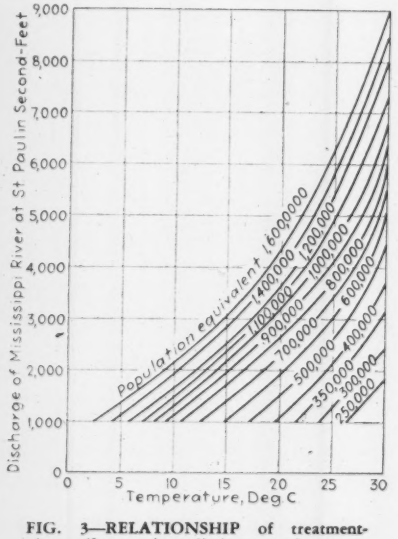


FIG. 3—RELATIONSHIP of treatment-plant effluent, river discharge and temperature to maintain a minimum of 2 p.p.m. of dissolved oxygen in the Hastings pool.

Degree of treatment required

Studies of the degree of treatment required made by the late J. A. Childs as chief engineer of the Metropolitan Drainage Commission were continued by him as sanitary engineer of the Sanitary District. The State Board of Health had set up requirements as follows: "(1) The public health hazard shall be reduced to a minimum. (2) The health of live stock shall not be materially in danger. (3) The present public nuisance shall be eliminated. (4) The fish life in the river, at least below the mouth of the St. Croix River, shall not be jeopardized." (The St. Croix River is the boundary between Minnesota and Wisconsin.) To comply with these requirements, Mr. Childs set up the following standards which were later adopted by the engineering board after an examination of the conditions along the river: The dissolved oxygen in the river should be maintained at or above 2 p.p.m. for 90 per cent of the summer months of the average year, above 1 p.p.m. for short periods and always above zero p.p.m.

All of the decisions as to type and degree of treatment rested on the study of oxygen balance in the river. Mr. Childs studied the Mississippi in six successive stretches from the northern boundary of Minneapolis to Lake Pepin, a distance of 70 miles. The division was based on variations in physical characteristics of each section and, in each, data were obtained on the existing supply of and demand for oxygen. The supply or input of oxygen consisted of that brought into the stretch by the river or its tributaries (determined from analysis of samples and measurement of flow) plus the amount supplied by surface reaeration. The demand for output of oxygen consisted of: (1) the oxidation of material carried in suspension or solution, (2) the oxidation of sludge, and (3) the oxygen carried out of the stretch by the river. Of these the first and third items were determined by analysis and from river flow. By using these quantities and equating the input to the output and using two simultaneous equations for comparable conditions, he evaluated the unknown quantities of surface reaeration and oxygen consumption by sludge. In making these computations, considerable adjustment was made, requiring seasoned judgment. Repeated comparisons were made with studies made along the Chicago Drainage Canal and the Illinois River and elsewhere. Results obtained and used for determining the degree of treatment required were checked from the standpoint of dilutions at various river flows. A chart applicable to each stretch was prepared to show net reaeration rates (Fig. 2).

A series of charts was then made to show the relationship of the river flow, population equivalent and water temperature for maintaining specified amounts of oxygen in the various stretches at and below the treatment plant (Fig. 3).

From these a final chart, Fig. 4, consisting of a hydrograph of the river from 1892 to 1935, was constructed with the degree of treatment required on a B.O.D. basis charted for each month directly under the hydrograph. From this chart the degree of treatment neces-

sary for each month could be read directly. The estimated percentage reductions of 5-day B.O.D. and suspended solids for average conditions of sewage flow are as follows:

Treatment	5-Day B.O.D.	Sus. Solids
Plain sedimentation	37	58
Sedimentation with chemicals	70	83
Plain sedimentation and filtration	47	74
Sedimentation, chemicals and filtration	75	90

One of the interesting deductions from the hydrograph was that the unprecedented low river flow from 1932 to 1935 probably represented a condition occurring only once in 50 to 100 years. If the works had been designed in 1930, the adequacy of primary treatment for a much larger percentage of the time would have been indicated.

For any type of plant it was concluded that screening and grit removal would be desirable; consequently a design for these functions was completed and a contract let in 1935 for a screen and grit-chamber substructure. It is now under construction. A superstructure, including provision for chemical storage and distribution devices, is being designed.

Determination of plant design

Notwithstanding the fact that chemical precipitation had been recommended and adopted by the trustees, in the preliminary designs it was first attempted to arrange the layout so that activated sludge could easily be accommodated if future higher river standards were required. As the studies progressed in 1935, further evidence appeared in support of the efficacy of modern chemical treatment. The possible use of magnetite filters for a higher degre of treatment appeared. Finally a general plan was evolved which gave full reliance on chemical precipitation for the occasionally needed secondary treatment. The first general plan was produced in June, 1935; it provided for sedimentation tanks capable of operation either in series or in parallel. Series operation was finally abandoned, and a general plan was prepared for parallel operation only, thereby notably simplifying both construction and operation, particularly from the hydraulic standpoint. In October, 1935, the report of the committee of the American Public Health Association on chemical treatment of sewage was presented containing evidence and opinion in support of parallel operation.

The plan of the Metropolitan Drainage Commission (1933) included separate sludge digestion and sludge-drying beds. By October, 1934, when the engineering board made its first report, evidence of the economy and desirability of dewatering sludge by vacuum filtration had accumulated which the engineering board deemed sufficient to indicate the substitution of vacuum filtration for sludge-drying beds. The subject of incineration of sludge cake was considered at length but finally rejected because of the apparent high cost. Inspection of the experimental incinerator at the West Side Chicago plant was made at this time. At no time did the production of fertilizer base appear to be economical.

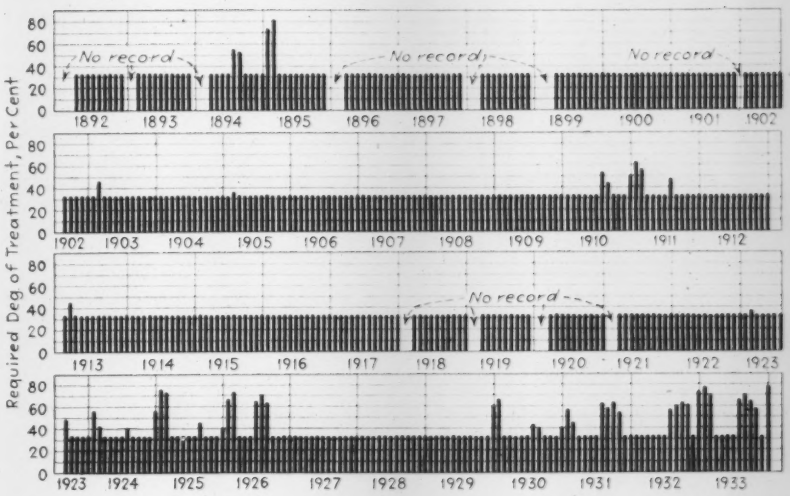


FIG. 4—DEGREE OF TREATMENT that would have been required for each month on the basis of 1945 pollution load and river discharge.

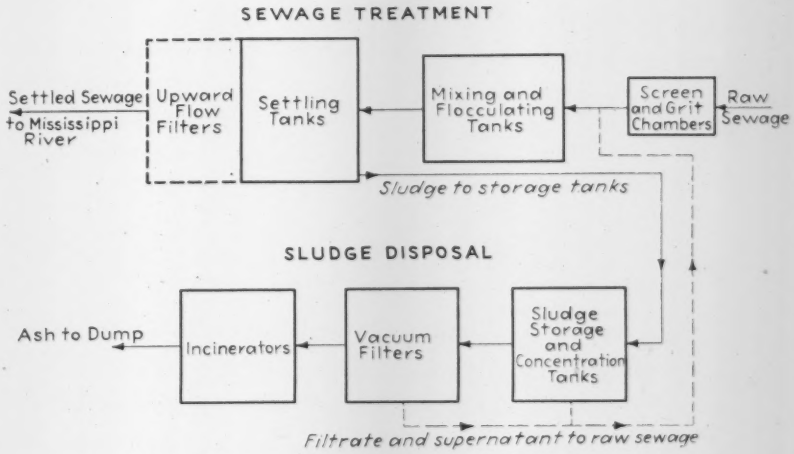


FIG. 5—FLOW DIAGRAM of parallel operation finally decided upon for Twin Cities sewage treatment.

Early in 1935 an incinerator for sludge cake was installed at Dearborn, Mich., and was inspected in July by the writer, who recommended that the possibility of dispensing with sludge digestion in connection with incineration be studied. Such a study was made in September and October, 1935. A month's investigation by K. A. Mick, chemist of the district, was made at the Perth Amboy, N. J., plant where undigested raw sludge was being vacuum filtered. It was found that the total annual costs would be about the same with or without digestion, but the initial cost of filtration and incineration without digestion would be considerably less. Having concluded that the filtration of undigested sludge was practicable in connection with immediate incineration, an additional desirable factor of operation was introduced by the more compact arrangement of the plant; the relatively distant digestion tanks and filter house of the earlier layout, forming a separate operating group, were dispensed with, and the filtration and incineration processes were housed together adjacent to the screens, grit chambers and sedimentation tanks with a probable material saving in operating costs. The variations in sludge production being unknown, the possible peak production caused some concern. This problem was left for final solution until actual operation. Raw-sludge storage for two to three days will be provided. Space adjacent to the filter and incineration building is available for additional stor-

age, which even may be so great as to require the peak loads to be held so long as to require digestion, at which time mixtures of undigested and digested sludge will be filtered. Operating conditions are expected to determine the relative economy of filter equipment and digestion tanks to take care of the peak production of sludge.

By November, 1935, a tentative final plan for the entire plant was drawn which included screen and grit chambers, parallel-operated sedimentation tanks with and without magnetite filters, with provision for disinfection by chlorination, and for sludge disposal by vacuum filtration followed by incineration.

After consultation with the firm of Fuller and McClintock and with the writer, the following conditions were accepted by the district, and detail plans were ordered to be begun by the board of trustees (Dec. 11, 1935): mixing, 3 min.; flocculation tanks, average detention, 26 min.; sedimentation tanks, average detention, 2 hours; vacuum filters, initial installation 160 to 180 tons per day; incinerators, initial installation, 150 tons per day. It was assumed that grit could not be mixed with sludge before filtration. Provisions are made for both prechlorination and post-chlorination for disinfection.

The members of the board of trustees are: A. G. Bastic, chairman, and Messrs. Gehan, Latimer, Rosen, Olson, Skellet and Benson. C. C. Wilbur is chief engineer of the Sanitary District. Wm. N. Carey is project engineer, PWA. Mr. Carey replaced the engineering board as representative of the PWA in July, 1935.

Progress of Safety in Building Construction

Difficulty in maintaining interest in safety with small volume of work at low prices pointed out in paper read at safety conference reviewing experience of New York contractors

By Wm. G. Wheeler
Secretary, Building Trades Employers' Assoc., New York City

WHAT'S WRONG with safety in the construction industry? This question was assigned to Mr. Wheeler as the subject of a paper read before the Seventh Greater New York Safety Conference on March 3. He answered it in part, confining his remarks to building construction, by pointing out that nothing is wrong. Citing the experience of the Building Trades Employers' Association in safety work, the author revealed that New York building contractors have made a well-planned attack on the safety problem, and the results have been encouraging despite the difficulties involved and the recent lack of interest because of the small volume of work and the low contract prices prevailing. The accompanying article is an abstract of Mr. Wheeler's paper. —EDITOR.

HAD I REALIZED the true significance of the subject, "What's wrong with safety in the construction industry?" I do not believe I would have accepted this assignment. The title itself is so broad in its scope that it covers the construction industry in all its branches. I know of no one person in the country who could represent the industry, and certainly I cannot. Nor am I qualified to prepare or to present a paper on safety for the construction industry. Therefore, I must take the liberty of limiting this discussion to those matters which pertain to the building branch of the construction industry.

In this title there looms the implication that something is definitely wrong with safety in our industry. There appears to be a direct challenge that the industry has failed to perform its duty. If that challenge were meant, I cannot deny the charge; and, as a corollary, I obviously cannot defend the building industry as a whole, for it is my belief that because of the peculiar nature of its business it has been able to do less actual accident-prevention work than have many other industries.

While I do not deny the charge as it may apply to the entire industry, I do not subscribe to the indictment as it may apply to contractors. I rise to their defense in the sense, particularly, that they are not guilty of non-feasance. I maintain that they have tried and shouldn't be condemned because their efforts were not more productive or were discontinued through no direct fault of their own. The contractors of the country, realizing their responsibility, organized through their assocations, both nationally and locally, and conducted some fine educational campaigns. Of course they were rather late in starting, much later in fact than many other industries, but when once started creditable showings were made. It cannot be said that they simply lay down, shirking their duty, because at the time depression hit the industry it was well on its way toward the goal of perhaps continuous safety set-ups in communities, and it only discontinued its activities when forced to do so because building construction practically stopped, and no extensive plans were feasible any more. Therefore, I can say that there was not so much wrong with safety on the contractors' part.

We are always confronted with the question, "Are building construction accidents increasing or decreasing?" No one seems to know because there are no records available to indicate definitely or scientifically either way, so the question for the present must remain unanswered. Nowhere are there data on exposure hours for the industry as a whole, nor a breakdown of its constituent parts so that a scientific rating of accident frequency and severity may be computed.

One of the first associations to take up organized safety educational work was the Building Trades Employers' Association of New York. It gave money unsparingly in conducting its campaign to educate in safety methods. The B.T.E.A. safety committee started from scratch and had to build up from the ground. It found that statistics were meager and unreliable, so it was forced to feel its way, teaching its doctrines to all of the elements as it groped along. It cooperated with every known agency, and it used the press liberally. It soon discovered contractors, some of the larger and the more responsible ones, already practicing safety with very beneficial financial success. It held them up as shining examples of what could be done by others, and in the course of a few years it had the contractors of this city, both in and out of our association, more or less safety-minded. It used various methods to reach the contractor. Its appeal to the humanitarian side struck a sympathetic chord, but the practical attack was to reach him through costs. This appeal to the pocketbook was able to prove to the contractor that money could be saved by cutting down frequency and severity rates. As its job was to spread its theories in every way possible, it didn't confine its work to the membership of the B.T.E.A. Its work was so expanded that very soon it was interesting contractors throughout the state and nation and in foreign countries. It commenced compiling statistics, and soon it built up comprehensible cross-sectional statistics of hazards in some 25 trades. Their greatest value was that contractors were being educated to keep records, but out of such statistics were born many pamphlets on safety. These were disseminated to anyone for the asking, regardless of affiliation. The association soon realized that its campaign was producing results, yet it was handicapped in many ways. Let us take, for instance, the case of the industrialist who needed a new plant. Invitations to bid followed with keen competition, and before the contractor got the job he was squeezed to the last penny. Therefore, he had little money for safety. Strange to say, this squeezing at times was by industrialists who were sold on safety and had made wonderful safety plant records of their own.

Take the case of workmen. Their unionized nature made them shy at all new rules, especially when it cost them any physical effort. It was difficult to educate them to climb stairs to the tenth floor when they could ride the derrick or when they could bribe the operator and ride a hod hoist or a bucket. The ordinary workman is much more interested in a good fairy story than in a scientific explanation of why an accident should not occur. He is fearful also that if he obeys safety rules too closely his fellow workmen will believe him to be in cahoots with the boss, or that the latter was attempting to exploit him. Printed material does not appeal to him very much. It makes no difference how well that material had been prepared either. The answer is simple. The average workman is a talker and a listener more than he is a reader. He is suspicious of "canned copy" because he cannot ask questions or demand proof. This is a matter of psychology, and our committee met it by safety meetings where he could ask all the questions he wanted to. Foremen conferences predominated at which the best-informed executive obtainable presided. The committee stimulated discussions. It probed for the uncertainties in their minds to bring into the open any misunderstandings that might have prevented a complete grasp of even the most elementary questions. The simpler the question the better, but it had to be answered as simply, accurately and completely as possible.

The majority of us realize that safety in our industry, in the final analysis, lies in the systematic and orderly merging of accident-prevention work with the construction supervising routine on a basis of facts recorded in a more intimate and effective manner. To merge and to record these facts intimately, it becomes necessary to have a knowledge of the real causes of injuries and, further, to have a real determination to get results. This is as logical and as well founded as is the determination to produce good construction in the estimated time and at a fair profit.

Responsibility for safety in building construction does not wholly lie with any one element of the industry. They all must share it in varying degrees. I am convinced that much of the responsibility rests with the fountain head—the architect. B.T.E.A. years ago prepared and advocated the use of a specification for safety which contained provisions for safeguarding the work to prevent injury. The association urged its use in work let by architects, and it received widespread publicity. When included in the specifications, it became a contractual responsibility on the part of the contractors over and above the requirements of law. It was a source of information to the contractor, and because of that it proved to be of value to us in our educational campaign. Architects would be assuming their part of the responsibility by selling this to owners and, further, by insisting on letting contracts only to responsible bidders who will conform to safety rules. In doing so, of course, they must be cognizant of the fact of the additional costs entailed.

The contractors' plight

Let us now go to the contractor. The public sees his work as the legion to lead us out of depression to at least potential recovery to prosperity. His is a service industry purely, yet he is looked upon to build better buildings, reduce costs and at the same time raise the income of the worker. He has been subjected to open criticism by federal administration officials, followed by official regulations that have amounted to persecution. These same officials have repeatedly said that the general contractor is a left-over of an obsolete economic order and is wholly unnecessary. That the subcontractor is also placed in that category is implicated by the fact that the government in competition with contractors has gone into the construction business. It may be true that the government has not attempted to erect the larger or more monumental structures, but they have taken the work from the smaller contractors, who in the last analysis employ the bulk of workmen as well as make up in the aggregate the dollar volume. At the present time contractors are dependent upon the crumbs doled out by an already harassed buying public. Is there any wonder that with taxes and more taxes, forms galore to be filled out and on top of that no work, the average contractor in his forced position of present-day keen competition neglects or purposedly omits to figure money for safety? I can say here that if he does figure a job to include the proper and necessary safety cost, he is liable to be in the subcellar on the list of bidders. The above only briefly outlines the position of contractors today. Those who will survive must have fortitude.

Today the contractors of this city are employing less than 20 per cent of the building trades workers. Members of our organization have been asked just recently what they could do to absorb the WPA workers back into private industry. The answer, generally, is the question, "How can that be done under present conditions?" But when business picks up, what will happen? Surely the contractor will not employ the many clerks, chauffeurs and tailors who are now attempting to do building workers' work under WPA. What will be the safety training of these men? No one knows, but they can make a good guess.

I cannot close leading you to believe that building construction safety rests only with architects, the contractors, the foreman and the workmen. In the usual building construction safety campaign, education is concentrated on these elements, but in the well-rounded-out program it is vital to educate lending institutions to their responsibilities. In our New York City campaign we directed serious thought to them by direct contact. We showed them that the cost of accidents was passed on to the public, and that when a contractor cut down his accidents the cost of building construction was lowered, reflecting itself in a benefit to real estate. They were told that through our efforts we were doing all we could to keep down ultimate costs of construction and that they, when financing a project, should take this into consideration and insist that invitations to bid be given only to those who practiced safety methods.

All of these elements are a part of the reading public, so to reach those whom we could not directly contact, including the families in our homes, we conducted a publicity campaign under a director. In some instances it was difficult to get certain newspapers to carry our stories, as we were confronted with the argument that our releases were more or less academic in nature and not strictly news. We had to convince those that it was the duty of the press to help us with our educational program. Thus in one year we had over 30,000 lines of publicity in some 700 different items.

I am not aware at the present time of any organized effort being carried on in our industry. I do know that in many individual concerns every effort is being made, but they are companies that have carried on safety strictly as a part of their business for many years. My personal experience is that it is futile to attempt to interest contracting firms in safety work when they have no jobs, and that the advocacy of an appropriation to conduct an active association safety campaign would hardly be considered seriously.

I am firmly convinced, however, that just as soon as business picks up or gets anywhere near normal, the need for safety work in our industry as an association activity will be imperative.

Boulder Dam Power Line

Working along the entire front of the 40-mile western section of the Boulder power transmission line, construction crews of the Los Angeles Bureau of Power and Light are rushing to complete the system in time to receive power from Boulder Dam in July. The entire east portion of the line, from Cajon Pass to Boulder, has been practically completed. All towers have been erected and the copper conductor strung. At Victorville and Silver Lake two switching stations have been completed, at a cost of about $1,000,000 each.

In the power house at the base of Boulder Dam engineers of the federal government, in cooperation with the engineers of the Power Bureau, are installing the electrical generating machinery. On the Nevada side of the Colorado River much of the machinery has been installed, and from these units Los Angeles will receive the first electricity to be generated.

Practical Soil Mechanics at Muskingum—II

By Theodore T. Knappen and Robert R. Philippe
Chief, Engineering Division, and Director, Soils Mechanics Laboratory, U. S. Engineer Office, Zanesville, Ohio

Destabilizing Effect of Seepage

FOLLOWING the preliminary soils studies at Muskingum (*ENR*, March 26, 1936, p. 453) it was decided that special study was required of seepage through embankment and foundations. In earth-dam design the problems of seepage are, first, quantity of flow and, second, the destabilizing effect of such flow. It is apparent that the proposed use and type of a dam fix the criteria in allowable seepage quantities. For example, a seepage loss of major import in a power dam is of little consequence in a flood-control dam.

The reservoirs in the Muskingum project are primarily for flood control. In some instances large water conservation storage is proposed, but even in these cases, the value of the stored water is not so great as to make it imperative to provide for any restrictions of flow through the foundations except to the extent necessary for stability. It might be further stated that no large conservation pools have been provided where the minimum streamflow would not be adequate to compensate for seepage losses. The problem, therefore, narrows down to where the allowable seepage depends upon the effects of such flow on the stability of the structure. Questions of piping, therefore, are of major import.

What is piping?

A clear-cut understanding of what constitutes piping is essential to the proper solution of such problems. Piping occurs when the force exerted on the soil by the seeping water exceeds the resistive force offered by the soil. In a cohesionless soil, where upward flow exists, when the head loss per foot of length equals or exceeds the submerged effective weight of that foot of material, movement will take place. For example: if the weight of a foot cube of soil is equal to 125 lb. and the porosity is 0.41, the submerged weight is 62.5 lb.; hence, if there is 1-ft. head loss vertically through that foot, the force will be equal to 62.5 lb., and a balanced condition occurs and movement impends. Hence with an upward flow of water, piping takes place when the hydraulic gradient is equal to one under these conditions. It follows that if the path of percolation for a given condition is sufficiently long, piping cannot occur.

The flow conditions for an embankment are basically expressed in Darcy's law here written as: $Q = kiA$, where Q is the flow in time t; K is the coefficient of permeability; i is the hydraulic gradient, expressed as the loss of head over the length of path of percolation; and A is the superficial area of flow. The problem of determining seepage by this method is conceivably subject to solution by mathematical methods. As a practical matter, the solution has been developed only for limited cases where materials are homogeneous. These cases never existed in practice on the Muskingum project. Fortunately, a solution of the problem is simplified by model studies, applying the proper laws of similitude.

Testing for permeability coefficients

To develop a solution for permeability, it was found necessary to determine the coefficients of permeability for each of the materials in the embankment and foundation of the prototype. The coefficient k of permeability for material has been determined on this

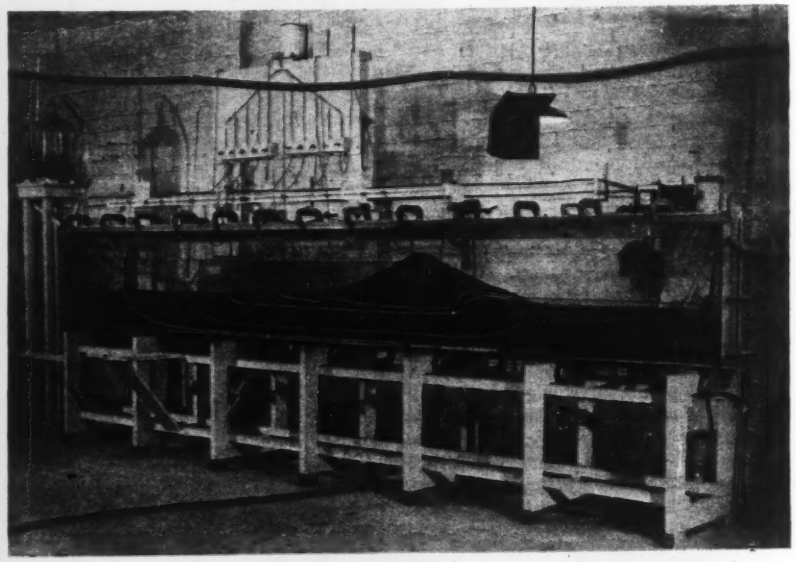


FIG. 4—DYES WERE USED to show the seepage flow in model dams constructed in a glass-sided testing tank 14 ft. long. Note that the lines show water movement in both embankment and foundation.

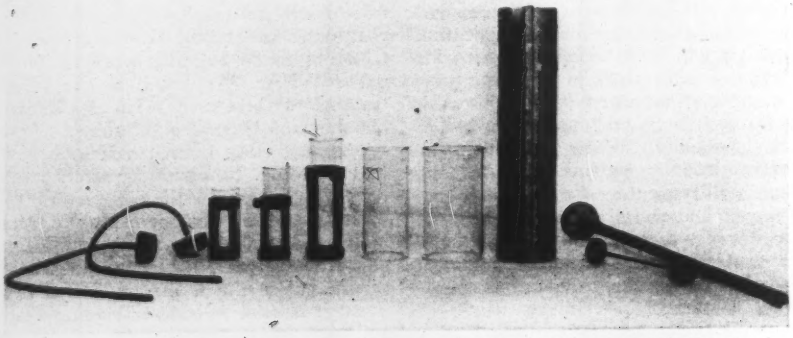


FIG. 5—PERMEABILITY COEFFICIENTS for remolded soils for dam embankment were determined by permeameters of various types for various materials.

project by utilizing the principle of the falling-head permeameter. This consists in establishing flow conditions through a sample of the material by establishing a head on the sample and fixing the tailwater level. The drop in the headwater surface in terms of time under known temperature conditions provides the necessary information for the solution of Darcy's law when written for these conditions. The solution of the expression is written:

$$K = \frac{aL}{At_1}\log_e \frac{H_0}{H_1}$$

Where a = the standpipe area, A = cross-sectional area of the sample, L = length of the sample, H_0 = initial head, and H_1 = head at time t_1.

The coefficient of permeability is dependent, among other things, upon the density and structure of the soil under consideration. It is necessary, therefore, that undisturbed samples of the embankment and foundation materials be obtained to determine the basic permeability of the different materials in the prototype. As these tests are made in advance of embankment construction, the permeability of the embankment in the prototype may be determined only by selecting materials proposed for use and molding them to their planned condition in the embankment. For determinations of the permeabilities of the foundation materials, it is necessary actually to obtain undisturbed samples in the field and test them in as close to natural conditions as possible.

The remolded tests on borrow materials are made in the permeameters shown by Fig. 5, the various types being made to fit conditions and materials. In each case the sample to be tested is tamped in dry and allowed to saturate by capillarity, after which a head is applied and measurements are taken. The test is repeated at several different densities, and the relation of permeability and density is fixed. The void ratio plotted against permeability on logarithmic scales produces a straight line. As materials are placed in embankments at about the plastic limit, the void ratio at this point is used to fix its density. The accuracy demanded depends on the condition considered. For example, the accuracy in fixing the permeability of an impervious embankment on a pervious foundation need not be great, as most of the flow passes through the foundation, which is where accuracy is demanded.

For the solution of specific foundation problems the actual permeability of the undisturbed foundation material, as pointed out above, must be accurately obtained. To get this result, undisturbed samples of the foundation materials are obtained by sinking test pits at the site and taking samples by cutting away the soil around a 12-in-square box, shown by Fig. 6, as it is lowered so as to encompass the sample. These samples are brought into the

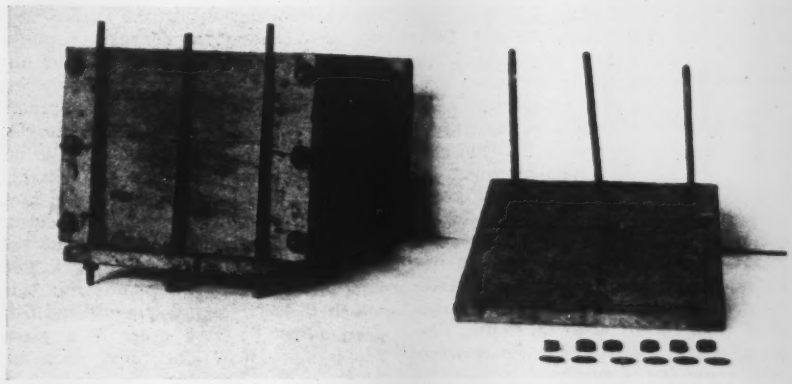


FIG. 6—UNDISTURBED SOIL SAMPLES from the dam foundations were taken by setting a box on the bottom of a pit and excavating around it so that it embraced a core of undisturbed soil as it sank.

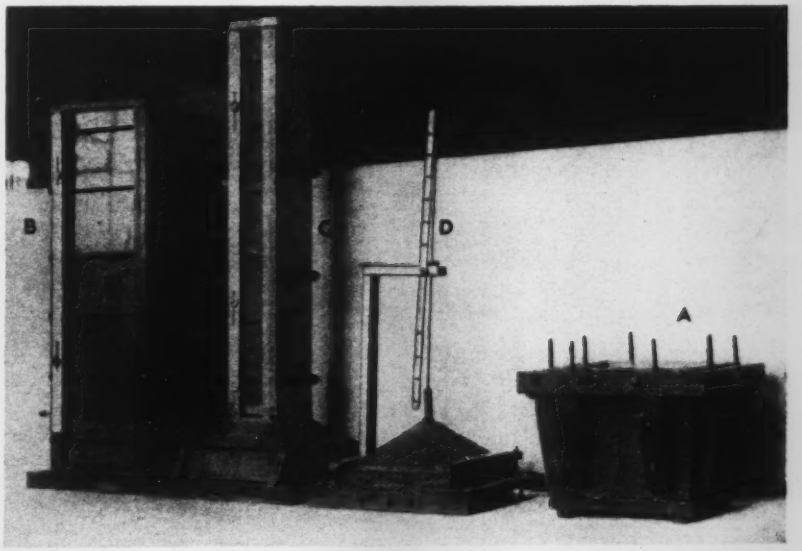


FIG. 7—PERMEABILITY COEFFICIENTS for undisturbed soils were determined by clamping standpipes B, C or D on the box A containing the soil sample to form permeameters.

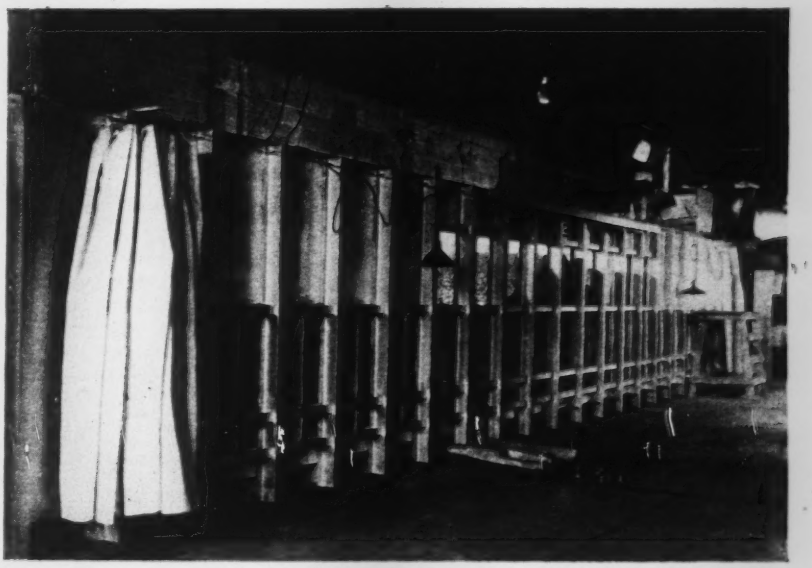


FIG. 8—STEEL TANK, with glass panels, 40 ft. long, 6 ft. deep and 3 ft. wide, was used for occasional tests of large models for seepage flow.

laboratory where the sides of the box are progressively removed, and four sides of the sample are sealed in paraffin. The sample is then sealed into a testing box *A* (Fig. 7) open at both ends with filters of sand and fine gravel placed over the open ends, and the box so filled is set in a tub of water to saturate. After saturation is completed, a standpipe is bolted and sealed to the top of the box and filled with water. The cross-sectional area of the standpipe is large for coarse materials and small for fine materials. The variation is from 100 sq.in. to .06 sq.in. The rate at which the water column drops in the standpipe is recorded; this gives the required data for the solution of Darcy's law, as written above.

Model studies of seepage

The foregoing discussion has developed the underlying principles of the method of determining the coefficient *k* for permeability in Darcy's formula. At present, as previously pointed out, the application of Darcy's formula in a purely analytical manner is impracticable for non-homogeneous cases, but by experimental means the seepage determinations may be made. To do this, model studies, following the usual laws of similitude, are required. The equipment for this purpose consists of two types of model tanks. One is a steel tank with glass panels on one side, which is 40 ft. long, 3 ft. wide and 6 ft. deep (Fig. 8); the other is a glass-sided tank 14 ft. long, 2 ft. deep and 1½ in. wide (Fig. 4).

The first tank is equipped with manometer connections to give the pressure at many points throughout the model. The difficulty, however, of making model experiments in this large tank precludes its use except in a very few cases. The large volume of the tank requires comparatively large quantities of material to be placed, and the careful placing of these materials takes so much time and is so expensive that the use of the tank in most cases is uneconomical; often the length of time required in setting up and running a series of tests precludes the use of the results for design purposes. Studies of the results obtained from this tank and the results of model experiments from the glass-sided tank give comparable results, so that most of the experimental work is carried on in the smaller glass-sided tank.

In setting up models in the smaller tank, materials are used for foundations and embankment which bear the same relative permeability to the materials in nature and to each other. Materials of permeability having values of *K* less than 20x10–4 cm./sec. are not used in the small tank, to avoid the distortion due to the capillary action in these materials. In placing materials in the model tank, the finer materials are tamped in place in thin layers, maintaining water level in the tank at about the level of the layer previously placed, depending upon the capillary action to bring the water up through the layer being placed and force all air out. The coarser materials (coarser than the 65-mesh sieve) are placed under water and agitated, to force air out and insure uniform deposition. As shown by Fig. 4, an overflow siphon system is set up to maintain constant water levels above and below the model in the tank. Provision is made to measure the amount of water drawn out from the lower side of the model.

To make a study of the seepage characteristics of a proposed embankment and foundation, the foundation and the embankment are reproduced in the model tank with proportional permeabilities to those in nature so as to give to scale an exact reproduction of conditions in nature, as they would be if the proposed design were constructed. The headwater and tailwater levels as they will exist in nature are set up, and by means of the siphon arrangement these levels are maintained throughout the test. An examination of the model in operation will indicate whether or not there is any piping or tendency to piping in the model and hence to be expected in the prototype. The line of saturation in the model may also be determined by the use of dye lines at the maximum water surface, as later discussed. However, to determine the quantitative results of the model tests with reference to the prototype, it is necessary to develop a flow net for the application of Darcy's law.

A flow net, simply stated, is a tracing of the lines of equal potential from headwater to tailwater and the related lines of flow of seeping water. The equipotential and flow lines are normal to each other and must be drawn so as to obtain homologous rectangles. As

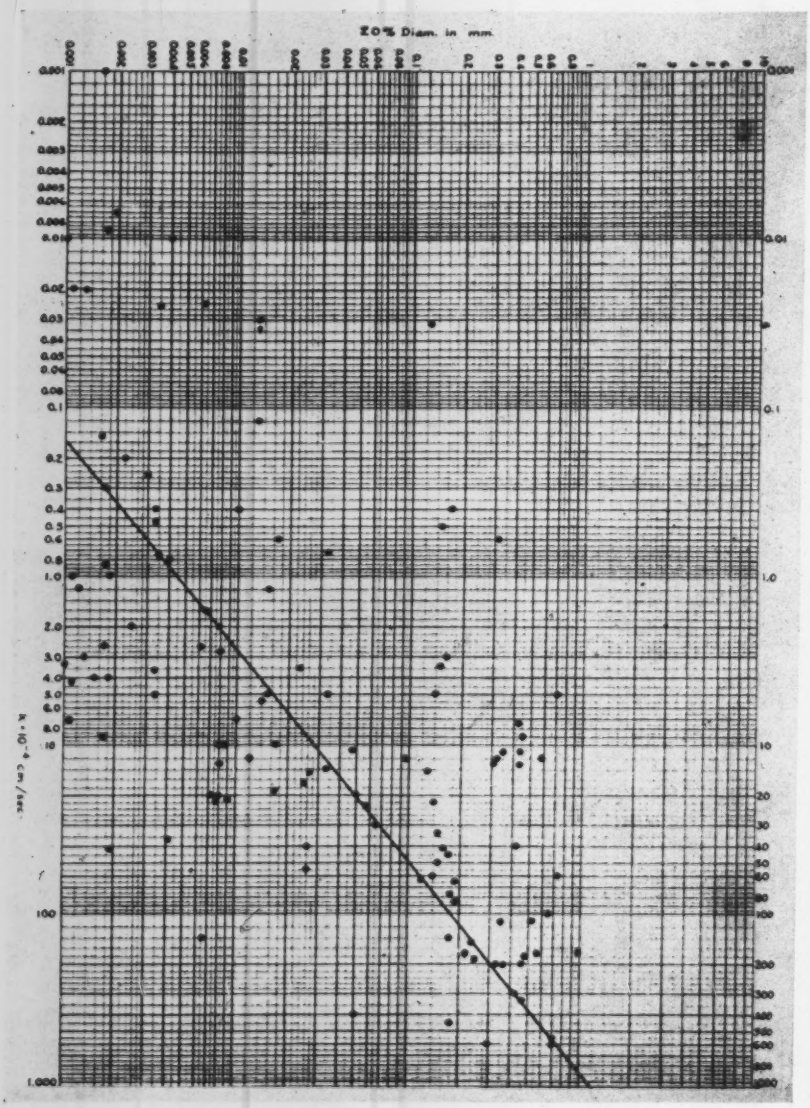


FIG. 9—RESULTS OF PERMEABILITY TESTS on undisturbed samples, showing the wide variations from the mean line.

previously stated, in the large tank it was possible to get the lines of pressure directly, as manometer openings were provided on the steel side of this tank. However, in the narrow glass tank this cannot be done, but the flow lines may be determined by introducing dye along the face of the tank and tracing the path of the dye through the model. Fig. 4 shows the tubes of dye inserted along the equipotential surface of the foundation and the embankment at intersection with the face of the glass and the path taken by the dye carried through the model by the seeping water. Guided by the traces of these dye lines, flow nets were developed for Tappan Dam (Fig. 10). From the flow net the seepage for the prototype may be computed, knowing the permeability of the materials and the headwater and tailwater elevations, using the formula:

$$Q = K_b \frac{N_1}{N_2} H$$

where Q = flow in time t, K_b = basic permeability, N_1 = number of flow tubes, N_2 = number of equipotential drops, and H = net head.

In connection with the studies made for this project, permeability determinations were run on several hundred undisturbed samples. For each one of these samples the mechanical analysis was prepared. After study, it was realized that the 20 per cent size—that is, the size for which 20 per cent of the sample was finer—was more indicative of the permeability than a larger size. A finer size was not used, because in many materials the 20 per cent size is about the smallest that can be readily determined by the methods outlined herein.

Fig. 9 shows the mean curve developed from plotting these results. It should be pointed out that this curve is an average of many results, and the individual result varies greatly from the mean curve. The curve, therefore, should only be used where the 20 per cent size that is taken into the curve is obtained from averaging a large number of foundation samples. Working on this basis, the curve can be very helpful in making permeability studies. This curve is particularly recommended for preliminary use. For final investigations it is preferable to determine the permeability of the actual undisturbed samples of the material where they can be obtained. The permeabilities obtained by use of this curve were checked against permeabilities computed from pumping tests on test pits, and the results obtained closely corroborated the permeabilities determined by use of the curve.

In connection with the studies of the Mohawk Dam, which is 115 ft. high, founded on sand and gravel foundations 120 ft. deep, eight model studies were made. As a result of these studies the development of the upstream blanket and downstream rock toe drainage system were worked out. Fig. 4 illustrates one of these studies in process.

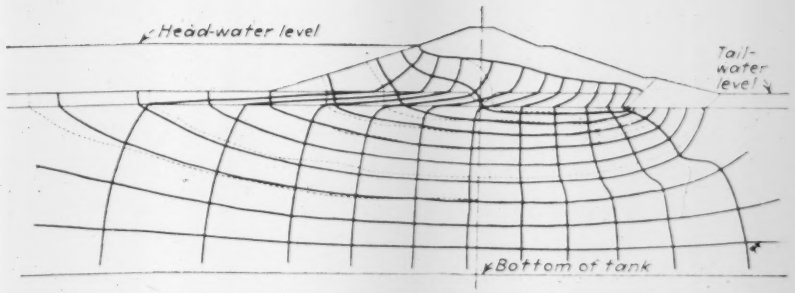


FIG. 10—FLOW NET OF LINES of equal potential and lines of seepage flow as determined by model tests for the Tappan Dam.

Value of model studies

It is difficult to overestimate the value of the permeability model studies in developing the design of earth dams. The effectiveness of such measures as sheetpiling, blankets, rock toes, downstream drains and design of embankment section can be very well illustrated. In many cases on this project early ideas indicated the possibility of using some type of extensive cutoff. However, model studies showed, with one exception, that no cutoff could be constructed at a reasonable cost that would have any appreciable effect on reducing seepage. On the other hand, it was shown that with the expenditure of less money more beneficial results could be obtained by extending an impervious rolled blanket upstream from, and connecting with, the impervious sections of the dam. In all cases, except the one noted, this relation was developed due to the very great depth of the valley fills upon which the embankments were constructed. In many of the embankments with deep valley fills, concrete key walls were used along the abutments where rock was close to the surface, to tie the impervious section of the embankment into the rock hillsides, which were in turn sealed by grouting.

Another valuable application of these studies was in connection with levee plans for towns lying within the reservoir areas, where pumping capacities to take care of seepage requirements could be determined with reasonable accuracy. In every case the model runs indicated the great value of constructing embankments as reverse filters; that is to say, grading from the most impervious material available near the upstream face to the most pervious material available at the toe and downstream face.

These model studies were conducted in the glass-sided tank at a very reasonable expense. The studies generally took about two or sometimes three days to run for any particular section. In several cases, where results indicated the desirability of changing the design, several different studies were made on various designs for any particular section of the embankment. For the Bolivar and Mohawk embankments the studies indicated that there was nothing to be gained by the inclusion of a rock toe on the high gravel terraces that partly fill the valley at the sites, where they had originally been planned in each case. At Mohawk the studies indicated potential piping on the downstream side of this terrace with the original design. This was rectified by lengthening the upstream artificial blanket and the substitution of a rock toe at the foot of the terrace and a rockfill over the lower section of the back slope of the terrace with a heavy rockfill over the connection between the downstream side of the terrace section and the main embankment section. Numerous other instances may be cited where designs were improved and costs reduced by the careful application of these studies. A most valuable result, as pointed out above, was the development of the use of the upstream blanket in place of cutoffs at a very considerable economy.

* * *

The next article will describe tests, including the photo-electric test using polarized light, for determining the resisting strength of foundations.

Los Angeles Builds Sewage-Works for San Pedro-Wilmington

Besides replacing its large sewage-screening plants by settling tanks (*ENR*, Jan. 16, 1936, p. 107), the city of Los Angeles, Calif., is building a smaller sedimentation-digestion plant on Terminal Island, to serve 50,000 people in the San Pedro-Wilmington area.

The plant includes an 85-ft. dia. siphon-feed, automatically-cleaned settling tank; a 75-ft. dia. digester with 27-ft. side walls; three decantation tanks, 16 ft. in diameter and 30 ft. high; sewage and sludge pumps; an office, laboratory, storeroom, shop and garage; a small heater for the digester and the building; a Paschall flume to measure the effluent; a submarine outfall sewer 1,000 ft. long; and sand sludge-drying beds. Lloyd Aldrich is city engineer, and Merrill Butler deputy engineer.

Designing Cylindrical Walls for Concentrated Annular Loads

By A. B. Asch
Chief Designer, Filtration Equipment Corp., New York, N. Y.

WERE ONE to judge by the scarcity of information on the subject, the occurrence of concentrated annular loading on circular walls has been uncommon. One example of this type of loading, however, occurs in the Laughlin clarifier used in sewage-treatment work. Essentially this clarifier is a filter, superimposed on a settling tank. The filter bed of crushed magnetite ore is carried in an annular trough near the top of the settling tank and is supported by brackets tied into the tank wall. The problem of designing the wall to support these cantilevers is required to be solved.

In order to keep the design method generally applicable, it is assumed that the tank is empty and above ground. As hoop reinforcing is used, the stresses caused by the filter bed and those caused by the earth and fluid pressures are readily combined. Fig. 1 shows a section of tank wall and filter bed. The weight of the filter bed L acting at a distance d from the inner face of the wall introduces a bending moment M_L in the cantilever, which transmits it to the wall of the tank. This moment is resisted by a force couple T and C as in a concrete beam. Since the moment arm of the couple is jd, $T = C = \dfrac{M_L}{jd}$ (1)

The forces T in the upper plane (Fig. 2) may be assumed to act similarly to the ribs of a partly closed umbrella, while those in the lower plane (forces C) tend to deform the circle into a polygon. These tendencies indicate the difference in the effect of annular concentrated loading and annular continuous loading, the latter merely expanding or contracting the shell. Where in the latter pure tension and compression alone exist, the concentrated loads introduce a flexural action also.

The effect of these forces may be determined by examining one of the symmetrical wall segments (see Fig. 3). Force T, for example, may be resolved into two equal forces:

$$C_T = \frac{T}{2 \sin \frac{\theta}{2}} = \frac{M_L}{2\, jd \sin \frac{\theta}{2}} \qquad (2)$$

where θ is the angle between the cantilevers. Except for the direction of the forces, Fig. 2 might represent the resolved forces shown for the lower ring. In Fig. 3 force C_T exerts a compressive effect upon the wall segment at the section where it acts directly and a compressive stress plus a flexural stress at every other section. At plane A, which bisects angle θ, the moment arm x and hence the flexural stress is a maximum, making this the critical section.

The analysis of the tank shell to resist these forces requires the assumption that one-half the length jd resists C_T, while the other half resists T_C, the component of C. In order to keep the resisting stresses uniformly equal, it is also necessary to let C_T and T_C act upon the center of the resisting section, which becomes jd high and b wide (Fig. 1).

The upper section, therefore, is subjected to a compressive stress $s_1 = C_T/jdb$ and a flexural stress $s_2 = M/S = C_T x/S = 6C_T x/b^2 jd$. These stresses may be expressed in terms of moment by substituting the values from Eq. 2 for C_T and letting the value of $x = R\,(1 - \cos \theta/2)$.

Similarly the lower section is subjected to a tensile stress $s_3 = T_C/jb$ and a flexural stress $s_4 = T_C x/S$.

To simplify the determination of the reinforcement, it is assumed that the tank-wall section is divided into four panels designated inner top, outer top, inner bottom, and outer bottom. The diagrams in Fig. 4 indicate the resulting stresses acting on these panels. For example, it may be seen that if $s_1 + s_2$ exceeds s_c, the allowable compressive stress, the inner top panel requires compression reinforcing; if s_2 exceeds s_1, the outer top panel requires tension reinforcing; and if $s_4 - s_3$ exceeds s_c, the outer bottom panel requires compression reinforcing.

The inner bottom panel requires tension reinforcing for a total stress measured by the area of the triangle shown multiplied by jd. It may be noted that by this method no flexure is introduced in the wall footing.

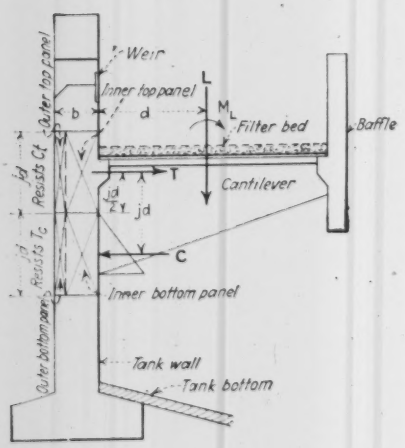


FIG. 1—SECTION of tank wall with filter bed supported on cantilever brackets, showing design conditions and assumptions.

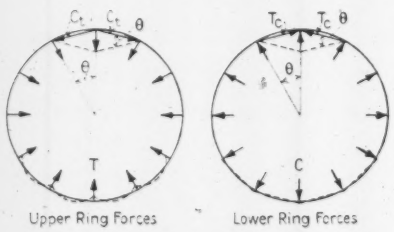


FIG. 2—DIAGRAMMATIC ACTION of force couple in tank wall that resists cantilever moment.

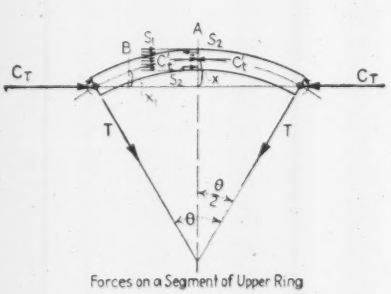


FIG. 3—DIAGRAM of forces acting on segment of upper ring.

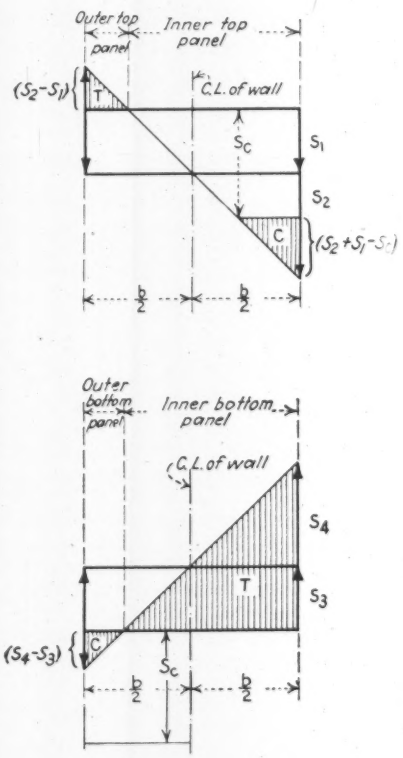


FIG. 4—STRESSES acting on four panels of the wall into which the section is arbitrarily divided as an aid in determining the amount and kind of reinforcing required.

Smoothing Stabilized Gravel for Asphalt Surfacing

Restoring pitted and corrugated stabilized soil roads for seal coating calls for a special technique of watering, blading and rolling

By E. G. Hurst
Junior Highway Engineer, Illinois Division of Highways, East St. Louis, Ill.

SINCE the innovation of stabilized surfaces, the problem of their maintenance has been a pertinent one; when the Illinois highway department began the practice of sealing some of the stabilized sections with an asphaltic skin coat, a method for bringing these surfaces to a true cross-section was needed. This problem was solved satisfactorily by the methods of construction employed on a road in Jersey County, Ill., which was stabilized in the fall of 1934.

The road had a 20-ft. surface with about a 4-in. crown, 6 in. thick at the center, tapering to feather edges, laid on a newly constructed subgrade. The aggregate was river gravel, applied 32 cu.yd. per station, and the stabilizing material was clay applied 6 cu.yd. per station. One-half pound of calcium chloride per square yard was sprinkled over the surface immediately upon completion of the construction, and a short time later 1 lb. per sq.yd. was applied.

Early in the spring of 1935 pot holes began to appear in the surface, and the curves began to show deep washboard corrugations. (About 60 per cent of this section was curved due to the desire to preserve a scenic approach to Pere Marquette Park.) Any blading that was at all beneficial had to be done immediately following a rainfall, and due to a rather dry summer the maintenance was not very effective and the pot holes steadily became wider and deeper. When the section was let for asphalt skin treatment in the fall of 1935, the problem arose of bringing the stabilized surface to a true cross-section.

For equipment the contractor had a crawler blade maintainer, a 5-ton three-wheel roller, an asphalt distributor and a power broom. The surface was wet with 0.5 gal. of water per square yard, and the blade maintainer was pulled over once; again 0.5 gal. of water per square yard was sprayed on the surface, and the roadway was bladed twice with the blade maintainer. Then the surface was sprinkled with 0.25 gal. of water per square yard and rolled with the roller, and the road was opened to traffic. This procedure did not prove satisfactory and was changed.

The surface was sprayed with two applications of water of 0.5 gal. per square yard each, and then bladed twice with the blade maintainer. Another application of 0.25 gal. of water per square yard was shot on the surface, and the blade maintainer was pulled over twice. This method produced adequate mortar to fill most of the pot holes and corrugations; and any that remained were filled by hand with mortar scooped from in front of the blade. After all the pot holes were completely filled, the surface was rolled with a dual-wheeled 1½-ton truck; this truck was operated at a speed of 10 miles per hour and proved much more satisfactory than the roller. The road was opened immediately to traffic, and for the following two days, early each morning, a shot of 0.25 gal. per square yard was applied to the surface. Then after a three-day drying period had elapsed, the surface was primed with a light cutback asphalt that served to waterproof the surface and hold it until the skin coat could be applied.

This method proved very satisfactory; a true cross-section was obtained without variations of any type. Twice during construction operations extremely heavy rains fell. The smoothed surface (that which had not been primed) held very well under this wet condition. Some of the pot holes reappeared but were about one-half their former depth; these were completely filled by one blading immediately following the rain. Ruts were formed by the water, creating an excess of mortar which squeezed up around automobile tires; these were eliminated either by rolling with the truck or a light blading, this being done just preceding the drying of the surface.

This road was resurfaced by the Walsh Oil Company, Inc., of Joliet, Ill. Construction was carried on under C. M. Hathaway, engineer of construction of the Illinois highway department, and S. F. Wilson, district engineer of District No. 8. The author was resident engineer.

Frost-Penetration Studies at Portland, Maine

STUDIES of frost conditions at Portland, Maine, are being carried out by the city's water department in an effort to find some method of guiding waterworks operators in anticipating freezing conditions.

In order to determine the rate at which the frost line descends during the first half of the winter and rises during the second half, thermometers were set in pipes at 6-in. intervals down to 5½ ft. below grade. The ends of the pipes are in a wooden meter box, and on one side of the box the pipes are in gravel and those on the other side in clay. The thermometers were installed in September, and when the ground had frozen to a depth of 1 ft. the thermometer at that depth showed a temperature of 32 deg. F. Each of the thermometers at the various depths has shown a regular decline since installation.

When there is but little frozen ground at the surface, the earth offers considerable resistance to the effects of cold weather, but when the water in the soil has turned to ice the resistance is much less and the cold travels down to the pipes more rapidly. This explains why it takes the months of December and January for the ground to freeze to a depth of 4 ft., while only a little extra cold during February will quickly freeze the pipes which, in Portland, are laid in a 5-ft. trench.

Portland air temperatures range, during the year, from about 30 deg. below zero to about 100 deg. above. Normal mean temperatures vary from 21 deg. on Jan. 25 to 69 deg. on July 25. The average normal snow blanket, which is about one-half the normal snowfall, increases to about 9 in. in February and then decreases. About Dec. 1 the ground begins to freeze and the frost line moves downward. The top inch of the ground surface for any day is probably at about the same temperature as the surrounding air, but as winter progresses the average temperature of the air falls below 32 deg. and the frost line descends. When the air temperature is more than 32 deg. F., the frost line tends to rise.

The movements of the frost line are affected by the snow blanket on the ground and the insulating value of the ground itself. At Portland the 60-year average normal deficiency reaches 750 deg. about March 15, decreasing to zero about May 15. The accumulated deficiency in degrees below freezing is found by subtracting the mean temperature for the day from 32 deg. and, beginning Dec. 1, adding each deficiency to that of the day before. In 1918 the Portland figure reached 1,500 deg., and last winter the high point was 1,150 deg.

Fourteen out of fifteen winters do not cause unusual trouble, and apparently the frost line goes nearly, but not quite to, the pipes under normal conditions. The temperature deficiency may reach 1,100 or 1,200 deg. with sufficient snow blanket, or trouble may come at times with perhaps 600-deg. deficiency and no snow blanket. At Portland the normal winter deficiency reaches 550 deg. on Feb. 9, and the snow blanket is 8 in. deep.

The studies of frost penetration and the relationship of frost penetration to weather conditions are being carried out under the direction of Harry U. Fuller, chief engineer, of the city water district.

Letters to the Editor

Davenport Bridge Tolls

Sir—Regarding the article on p. 334 of your Feb. 27 issue, on the Davenport Bridge traffic: In view of the terrible road conditions in Iowa, I think the statement as presented is hardly fair. For a few days of operation in November, prior to the marking of highway routes, placing of bridge signs and similar matters, the income was more than sufficient to meet interest and operating costs. However, from December to the time of writing, the road conditions in Iowa have been so bad that there has been very little traffic moving, and the bridge revenues have suffered accordingly.

This structure is in competition with a free bridge, and it will take some little time to convince the car owners and operators that the saving in time and mileage, by using this bridge rather than the free bridge, will be greater than the small toll charge. I believe when the through highways are completed, the street improvements finished in Moline and normal traffic conditions restored, that the actual returns will be sufficient to justify the financing of this venture by the PWA.

F. M. MASTERS,
Modjeski, Masters and Case, Inc.
Harrisburg, Pa.,
March 5, 1936.

Causes of Building-Frame Torsion Compared

Sir—In the last couple of years much has been written regarding the distribution of earthquake or wind loads to the resisting units, and the subject of torsion has been given particular attention to such an extent that it has become something of a bugaboo.

One analysis of a simple four-wall concrete building worked out in one of the booklets of the Portland Cement Association attempts to provide for effects of torsion. This analysis neglects the torsional resistance, in shear, of the walls normal to the loading, and this is on the safe side. However, the results obtained by the failure to consider the cross-walls are identical with those obtained by considering the end shear walls as the reactions to a simple beam with horizontal loading, and the relative "rigidities" of the two walls may be forgotten. This has been proved for the general case. Where more than two walls are involved, the procedure is more complicated.

For a little more than the past two years, the writer has been principally engaged in the design of new and rehabilitated school buildings, and he has yet to encounter the job where the conventional methods of lateral-force distribution are applicable without considerable modification, or where torsion is more than negligible. The assumptions upon which the conventional methods are based include two premises which in the majority of cases (for this type of building) are far from correct. These are: (1) a rigid distributing diaphragm at each floor level; and (2) a rigid foundation. The first assumption can be allowed for by equating the stiffness factors of the walls and the diaphragm, which is usually a corridor slab, and this seems to be quite generally practiced; but the second seems to have been overlooked entirely except by a few designers.

Much of the soil in this locality has a safe bearing value of only a few thousand pounds per sq. ft., and the load-test curves show it to be quite compressible. For short walls the deflection due to soil compressibility is very likely to be great enough to spoil entirely a lateral-force analysis which does not take this factor into consideration. In the analysis of one building which the writer made a couple of months ago, the deflection of a cross-wall due to shearing and moment stresses in the wall was found to be only about 10 per cent of the deflection due to soil compression.

It seems a shame to spend so much time and money on intricate and tedious analyses, without taking all factors into consideration and making due allowance for them.

BRUCE M. DACK,
Designing Engineer,
Parkinson & Parkinson, Architects.
Los Angeles, Calif.,
Jan. 28, 1936.

Building Trusses and Secondary Stresses

Sir—I was greatly interested in E. E. Seelye's article "Reducing Secondary Stress in High Trussed Bents," in your issue of Feb. 20, 1936. He and his associates have an interesting solution to a very important problem. I have been working on the problem of secondary stresses caused directly by the lengthening and shortening of the chords of a truss subjected to heavy column loads, and find that they are of great consequence.

In a bridge adequate provision can be made for the lengthening and shortening of the lower chord. That is not the case with the building truss, which is sandwiched between relatively stiff columns or adjacent framed panels, causing a restraint that develops horizontal truss reactions. The analysis in any case must be made by a return to basic fundamentals. In the past, heavily loaded building trusses have been supported upon free-standing columns, presumably to remo the secondary influence upon the fra This is satisfactory as long as the fr standing column is not tied to the throu columns.

In building trusses restraint is al caused by the gusset framing at the su porting columns. In some notable buil ings the truss has been pin-connected the supporting columns, which relieve the secondary stresses to some exte In 1935 the writer was in search of method by which the effect of gusset r straint might be evaluated. The meth that was found to be the most usable wa an adaptation of the Cross method of m ment distribution in which the fixed-en moments were derived by a considerati of the truss deflections caused by th primary direct stresses. Fixed-end m ments are written for all of the tru members; then considering all points contact with the building frame as fixe joints, the moments are distributed. Th resulting moments in the truss member at the column gussets are a measure o the truss fixed-end moments. The carry over factors to be used in actual distri bution are of the order of 5 to 10 per cen of the distributed moment, whereas normally for a uniform section the carry over factor is 50 per cent. This metho is fully described in "Tests and Design of Steel Wind Bent Irregularities," pub lished by the American Institute of Steel Construction. The authors of this paper are C. T. Morris, G. E. Large and S. T. Carpenter.

A building composed of many bents with several of them terminating at the lower levels of a building in a truss sup port for interior columns, presents a prob lem in determining the effective rigidity and the capacity of each bent to resist wind load. The bent with the truss pro vides a softness of support for the interior columns that is not a factor where all columns continue through to a stable foundation. In cases of unsymmetrical floor plans, this may lead to a new center of resistance and a twisting condition of the building as a whole.

Another factor in design, as the writer understands it, is the unloading of the columns supported by the truss. This may be pictured by assuming that the girders are fully riveted as erection proceeds upward. Every addition of dead load causes a deflection of the truss and an induction of a relieving shear in the girders framing to the supported column.

Some of the problems mentioned in this discussion are now undergoing research at Swarthmore College. We have built a steel model of a six-column bent, introducing a truss carrying two interior columns. We are working our model test in a vertical position with a simulated dead and live load. It is our intention to measure the secondary stresses and try out different methods of stress relief.

SAMUEL T. CARPENTER,
Instructor in Civil Engineering,
Swarthmore College.
Swarthmore, Pa.,
March 9, 1936.

Paper-Waste Pollution and Fish

Sir—An abstract of a paper by Vallin (*Proc.*, Inst. Fishery, No. 5, Stockholm) appeared in the "Current Notes on Sewage Disposal" in your issue of Jan. 23, 1936. This abstract described studies on the effect of various paper-mill wastes on fish. I was interested to note the close agreement between these results and a similar series of experiments conducted by Dr. A. E. Cole of the Wisconsin State Board of Health. Both experiments reported that sulphate waste is more detrimental to fish than sulphite products, and further, that, contrary to popular opinion, the fibrous material in paper-mill wastes does not clog the gills of healthy fish.

An article describing the Wisconsin experiment was published in *Sewage Works Journal*, March, 1935. In this paper Cole concludes that, "While the main effect of pollution by waste sulphite liquor lies in the depletion of dissolved oxygen content of the water, the waste also has a poisonous or toxic effect on fish life." Also "Waste sulphate liquor is definitely irritating to fish in concentrations of 1 to 500 or higher."

The similarity of the data obtained in Norway and Wisconsin should be gratifying to the experimenters and to those interested in this problem.

F. M. DAWSON,
Professor Hydraulic and Sanitary Engineering.
Madison, Wis.,
March 10, 1936.

Grade-Marked Lumber

Sir—May we call your attention to what is evidently an error in the Feb. 6 issue of *Engineering News-Record*. In the second paragraph on p. 188, under heading "Structural developments," this statement is made: "In timber, the year saw the abandonment of the grade-marking plan for designating structural timber and the substitution of specific stress values for the various types available."

This is not a true statement. Rather than being abandoned, grade-marking has made outstanding progress in the past year. Many departments of the federal government have included grade-marking as a requirement on lumber purchased, and a number of state associations of retail lumber dealers have officially urged wider use of the principle of grade-marking. The various regional manufacturers' associations developed a plan in the past year, whereby grade-marking would be featured as a national project as well as a regional undertaking. Recently a railroad (the C. & E. I.) adopted the requirement that all lumber shall be officially grade-marked.

The actual fact that the statement in the editorial evidently intended to express, is as follows: "The past year saw the abandonment *on the part of some associations* of the practice of designating structural timber by grade names and the substitution of specific stress values for the various grades available."

W. H. O'BRIEN,
Field Engineer,
Southern Pine Association.
New Orleans, La.,
March 12, 1936.

Ample Ohio Road Bidders

Sir—The statement was made in your issue of Feb. 13, 1936, p. 262, that the Ohio department of highways is confronted with a shortage of bidders when projects are offered, and that many contractors of the state have withdrawn from bidding on state highway projects because of the allegedly excessive number of man-hours required in the specifications for most of the projects being offered. The following is quoted from the statement:

> As an indication of the reluctance of bidders to submit figures on highway construction contracts, on Jan. 28, 1936, ten projects were offered for bids. Of these ten projects six failed to receive the necessary three bids to meet federal requirements and had to be readvertised.

This statement is founded on a misapprehension of the facts and is therefore apt to mislead readers as to the real situation. There were eleven projects offered on Jan. 28. Five of these projects with an estimated cost of $516,298, covered highway construction; on all of these projects the requisite number of bids was received, and contracts were awarded covering all of this work. The six projects on which the requisite number of bids was not received and on which it was therefore necessary to reject bids had an estimated cost of only $33,034, and all of them related entirely to roadside improvement or beautification and were therefore of interest only to nurserymen or those engaged in landscape beautification.

There have been a few highway construction projects offered in recent months by the Ohio department of highways on which bids have not been received, due to the fact that the estimates were not high enough to cover the largely increased cost created by man-hour requirements or for other similar causes. This condition has not been general, there is no "strike" of Ohio highway contractors, and there is every indication that there will be an ample supply of Ohio bidders on all work offered by the Ohio department of highways. In estimating the cost of projects carrying excessive man-hour requirements or other unusual conditions there is bound to arise the occasional case in which the estimate will not be sufficiently high to permit bidders to comply with the requirements and submit bids within the prescribed limits. That is the exent of the situation in Ohio, and the state officials are dealing with it by readjusting either the estimate or the plans and specifications. Ohio will apparently have a fair-sized highway construction program in 1936, but we have a supply of eager Ohio bidders ample to furnish the keenest kind of competition.

C. H. DUNCAN,
Secretary, Ohio Contractors Assoc.
Columbus, Ohio,
March 4, 1936.

A Tribute to James B. Francis

By H. K. BARROWS,
Professor of Hydraulic Engineering, Massachusetts Institute of Technology; Consulting Engineer, Boston, Mass.

THE NEW ENGLAND FLOOD again demonstrated the foresight and good judgment of one of the eminent hydraulic engineers of the past century, James B. Francis.

When in 1848 Mr. Francis, then engineer for the Locks and Canals Co. of Lowell, was constructing the great waterpower development at that city, he placed near the head of the Pawtucket Canal, one of the principal feeders of the power system, an emergency gate about 27 ft. wide and 25 ft. high, housed and held well above ordinary stages of the canal.

Mr. Francis from his studies of the Merrimack appreciated the probability of disastrous floods from a combination of rain and melting snow, and put in this gate for such possible emergencies. It was held up by an iron hook so that it could be quickly dropped when needed.

The people of Lowell scoffed at the probability of ever needing such a device and dubbed it "Francis' Folly." However, his predictions were soon verified. In 1852 came a great flood and the gate was used, shutting out flood waters and saving the industrial section of the city through which the canal runs. Then Mr. Francis was given a dinner and presented with a silver service by his grateful fellow citizens.

Since 1852, as far as information is available, this emergency gate has not again been used until the present flood. On March 19, 1936, after 84 years of rest, it again functioned, and once more the city was saved from unparalleled damage.

Thus, as stated in the press, the hero of the flood in Lowell was a hydraulic engineer, whose foresight and good judgment were vindicated, 40 years after his death, by a safety device that had remained idle for 84 years!

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April 9, 1936

Swift Striking Fury

NONE of the many exhibitions of Nature's destructive forces is so terrifying nor so nearly irresistible by the works of man as the tornado, and the one which struck northern Mississippi, Alabama and Georgia early this week ran true to form. Its path, as in the Illinois storm of 1925 and the St. Louis storm of 1927, was strewn with indiscriminate crushing, tearing apart and overthrowing of all manner of buildings and structures. Unlike the hurricane and the flood, the tornado gives little warning of its approach and its forces are largely unknown in magnitude or character. As a result the cyclone cellar complex of the early settlers has been perpetuated and engineers and laymen alike too often take a fatalistic view of any efforts to cope directly with tornado forces. The pioneer study of damage made by the Western Society of Engineers following the Illinois storm indicated that there are types of construction that will at least minimize damage, such as firm anchorage of building to foundation, effective ties between walls, roofs and floors, and the use of partitions as bracing diaphragms instead of as just room enclosures. For brick buildings, a substantial foundation, a wall laid up in cement mortar and reinforced with pilasters, and well-anchored floors and roof have proved to be effective. Every tornado's wreckage is a monument to poor construction, and there is no reason to believe that the debris of Tupelo, Anderson and Gainesville will be any exception. It should, nevertheless, be immediately examined by engineers. Only in this way will our knowledge of tornado effects be strengthened and our ability to resist the swift-striking fury of such storms be increased.

Useful Reconnaissance

MUCH IS TO BE EXPECTED from the comprehensive compilation of water projects that has just been initiated by the National Resources Committee. Its purpose of bringing together in orderly form an assembled record of all water improvement projects proposed on a selected series of important river systems will make available a mass of important information never brought together heretofore. It will also permit of correlating the several projects on a stream in order to determine their relative importance, the mutual interferences and the order in which they should be undertaken. In short, as a reconnaissance of water resource development the new study should produce results of decided value, both for immediate purposes and for long-time use. But it would be a mistake to expect too much from this reconnaissance. To regard it as a piece of water planning, or as putting any projects into shape for immediate execution, would be to misconceive the situation badly. Any water project of importance requires time and searching study before it can be planned soundly and with proper consideration of conflicting water needs. While one or two projects for which complete studies have already been carried through may be recommended for immediate execution on the showing of the reconnaissance, the chief practical result of the study will be to point out more definitely the controlling water-resource needs along the streams covered by the survey, and to indicate the directions in which active project-planning should proceed. If this purpose is well carried out, the survey will have accomplished all that can be expected of it.

New Subway Builders

LUXURY IN STRUCTURAL ELEMENTS and unapproached speed of construction distinguish the Moscow subway described in this issue. Technically also the newest of underground railways claims attention because of the variety of construction processes employed—some of them, particularly the consolidation of running soils by chemical injection, being unusual in extent of application. While not stinting credit for work accomplished, much greater reason for praise lies in the quickened self-reliance and spirit of independence developed in themselves by the Russian builders. Their engineers had never built a subway and had none of the major tools of such operations. But starting with an imported shield they developed a better design, built a shield in their own factories and wrote off all dependence on foreign help. Again confronted by exactions for the use of alien-controlled soil-consolidation processes they turned to research and developed an independent process. Those who follow the description of the Moscow subway in this issue will find other examples of declared independence in tools and processes. With 13 miles more subway under construction Russian engineers have become subway-builders of the first order boldly announcing that the new line will surpass the one built in every luxury and service.

A Zoning Opportunity

LAST OF THE LARGE CITIES to stabilize its present status and future development by zoning, Detroit after eighteen years of agitation is once more attempting to classify areas for residential, commercial and industrial uses. More than a thousand cities have protected themselves against undue encroachment of the undesirable, and virtually none that has tried it has abandoned or repudiated the zoning principle. On the other hand, many cases have been fought bitterly in the courts in attempts to change classifications or to prevent or punish violations. In short, as a broad result of the developments of the past two decades the principle of zoning has become thoroughly accepted. Why then do we still have growing deterioration, blight and slum conditions? In part it is because property owners, at the time the classification is made, desire to enhance their land values by obtaining commercial classification; their efforts all too often defeat the very objective sought, for business overzoning is a notorious evil in practically every city. Chicago, one of the first large cities to be zoned, has vastly more area zoned as industrial and commercial than it can ever hope to use, and other cities are relatively no better. The result is that an enormous area of run-down property and thousands of vacant lots, drag down the city's development and its treasury—the latter because of the unused service utilities they require. Detroit has an opportunity to profit by the sad experience of overzoning elsewhere. It should utilize the numerous surveys that have been made to determine how much business property is needed for a given population, how much apartment house area can be supported and what "factor of competition" is proper to apply.

Wanted—A Flood Control Policy

THE NATION is drifting into a situation in which precedent will fix the entire cost of flood control on the federal government. Already we have gone a long distance in that direction. Unless this aimless drift is promptly checked by adoption of a definite flood control policy in which benefited communities will bear part of the cost one or more of the bills recently presented to Congress as a result of March floods will get on the statute books and many more federally financed projects will be under way, so many that it will be too late to turn back.

When flood control work was undertaken in the Miami River valley in Ohio after the disastrous flood of 1913, no question was raised as to who should pay for it; the local communities took the burden on their own shoulders. Similarly at Pueblo and at Los Angeles in later years. But these undertakings were on rivers whose flood waters came from within the state. Interstate flood problems, involving waters that come from or flow into other states, are more complex.

The greatest of our interstate flood problems, that of the Mississippi, may be thought to show the way to a sound flood-control policy. Unfortunately it does nothing of the kind. Its circumstances are so individual and unique as to offer no precedent. When Congress after the great 1927 flood considered a vast project for controlling the Mississippi floods it concluded, after much discussion, that the work was a federal responsibility—because so many states contributed to the flood flow of the lower river and because the states of the lower valley already had spent large sums on flood protection.

Then came the depression period, with its commanding need for relief work. As one such relief operation the Muskingum Valley Conservancy District work was begun, an undertaking directly comparable to that of former years in the neighboring Miami valley, yet paid for in large part by the federal government. It is on a tributary of the Ohio, but its value is wholly local—in fact it may intensify the Ohio's floods. As another relief operation the construction of flood-control reservoirs on the purely intrastate Winooski River in Vermont was undertaken, using CCC forces. Still later the Tygart reservoir at the Ohio's head-waters was undertaken as a work-relief project at federal expense.

Thus, no flood-control policy has yet been laid down. The basic principles of such policy, however, are well recognized: that the cost shall be less than the benefits derived, and that those who are benefited by the protection shall bear the cost. That these principles can be applied successfully was brilliantly demonstrated on the Miami, and again at Pueblo.

Briefly, intrastate flood questions present no difficulty; the Ohio conservancy system and the New York river regulating districts offer a complete solution. On interstate streams the problem is somewhat intricate, since getting towns in Connecticut to pay for dams and reservoir sites in Vermont, or inducing Harrisburg and Sunbury to cooperate with Binghamton, is not as easy as operating within a single state. But interstate compacts offer an adequate means for bringing about such cooperation, as experience in other than flood-control matters has shown. When supplemented by federal participation in recognition of the federal interest in interstate stream questions they provide for every requirement of flood control.

It is important, therefore, that Congress set up the machinery through which such interstate compacts can be entered into on a uniform and equitable basis. And at the same time it is essential that Congress establish the policy that shall control the distribution of costs between local, state and federal interests, that it define the method by which the interstate projects are to be planned, and that it designate the federal agency through which the federal government is to be represented in carrying out the joint undertaking. Until such a definite federal policy is established no further federal funds should be appropriated for new flood-control operations, lest the act of appropriation under the present hysteria to do something to end floods result in fixing all flood-control costs on the federal government.

Make Maintenance Easier

NORMALCY in highway maintenance has become a badly shattered expectation in this first quarter of 1936. Blizzard snowfalls and subzero cold all through January and February put an almost breaking strain on snow removal organizations, equipment and finances. Immediately thereafter, March brought floods that softened surfaces, scoured shoulders and filled ditches over large areas. Now with April comes the regular spring breakup, intensified by abnormal frost penetration during weeks of freezing temperatures acting on surfaces cleared of protective snow. In every respect the cumulative task imposed on highway maintenance departments calls for the full resources of personnel and working plant. But in the stress of maintenance work we should not forget that design and construction can provide much relief from like work in the future.

For the next few months maintenance will in large measure be occupied with the work of restoration and structural repair required by the extraordinary attacks of flood and frost. Its methods are well determined by past experience, and the work thus brings no new problems; the maintenance engineer has to do only things he has done before. In this very fact, however, lies the question: Should this work be recurring and have to be done over and over?

As was indicated in these pages five weeks ago, highway transport has extended the problem of snowfall from snow removal to snow control. A similar change of objective is in order with respect to handling frost upheaval. The necessary principles of control have been well established by soils research, and practice in base stabilization and drainage is capable of meeting any demands of frost-action. This knowledge merely needs to be applied in suitable design and construction, to reduce maintenance.

Flood control is not the highway engineer's problem. His work is to build roads so that the risk of flood interference and damage will be held to a minimum. The details are not a part of this discussion, but they offer no engineering difficulties; roads can readily be built that will withstand inundation, and more effective construction can be devised to prevent damage to roads in floods.

Maintenance, overburdened this year by snowfall and frost and by unusual overflows, need not continue to bear this burden if proper and reasonable control measures are exercised. This calls for a clear comprehension of the highway as an operating structure, and for such location, design and construction as will ensure continuous safe movement of traffic even in flood emergencies. If this is accomplished maintenance will have its present problems reduced, and transport will be better served.

CURRENT NEWS

Congress Slows Action On Flood Bills

With floods no longer accorded as much public attention, Congress has slowed up its consideration of flood control and flood relief legislation and has gone back to normal routine.

The omnibus rivers and harbors appropriation still rests in the hands of the Senate Commerce Committee, which has completed hearings but is still concerned with the problem of what to include and what to throw out. How much in excess of the $315,000,000 now included it will be found advisable to keep in the bill has not yet been ascertained. The Overton bill, carrying $272,000,000 for Mississippi River controlling works, has been made the unfinished business of the Senate.

Having passed the House, April 1, the bill liberalizing RFC regulations and authorizing rehabilitation loans by that agency in flood regions is under consideration by the Senate Committee on Banking and Currency, and an early report is expected. Congressmen from the flood regions who introduced a resolution appointing a ten-man committee to survey flood damage and report recommendations have, at the suggestion of the House Rules Committee, withdrawn it for redrafting.

Surveys included in bills

The Senate Commerce Committee reported favorably a bill giving blanket authority to Massachusetts to replace toll-free highway bridges over navigable waters. Favorable reports were presented by the Senate Flood Control Committee on two bills authorizing preliminary examinations of the Blackstone, Seekonk, Moshassuk and Woonasquatucket rivers and their tributaries in Rhode Island, and of New Creek, Staten Island, N. Y.

Other preliminary examinations would be authorized in bills introduced to cover the following streams: Poteau River, Ark.; Congaree, Santee and Cooper rivers and their tributaries in South Carolina; Sandusky River at Fremont, Ohio, and Sulphur River in Arkansas.

The Senate Committee on Banking and Currency is also considering a bill introduced by Senators Walsh and Bulkley amending the National Housing Act to permit FHA guarantees on bank loans to restore, rebuild or replace real property, equipment and machinery damaged by the flood. Limits would be $2,000 on residential, $50,000 on industrial and commercial properties. FHA's guarantee, now only 10 per cent, would remain at 20 per cent in flood territory for emergency loans.

Senator Vandenberg's objections to the Overton bill were met by amendments safeguarding the government on land costs, thus removing the major obstacle to its passage. The Senate Committee reported favorably a bill for RFC loans, adding as an amendment to the House version the entire bill allowing FHA insurance on modernization loans in flood area and increasing the loan limit from $25,000,000 to $50,000,000.

Fontana Dam Site May Go to TVA

Reliable reports state that land and riparian rights have been acquired by TVA at Fontana, N. C.

POSSESSION of the land and riparian rights required for the construction of a storage reservoir and power plant at the Fontana site on the Little Tennessee River in North Carolina is to pass from the Aluminum Company of America to the Tennessee Valley Authority in the near future, according to reports from reliable sources. Construction of Fontana Dam was recommended by the TVA in its recent report to Congress (*ENR*, April 2, p. 504). In that report, the directors of the TVA indicated that the site, estimated to be worth $3,500,000, is to be acquired through an agreement to exchange power.

The Fontana site is one of the most desirable ones in the Tennessee Valley as the Little Tennessee River drains an area in the mountains of North Carolina and Georgia that has an annual rainfall of 61 in. The upper portion of the river has a steep slope. Several years ago the Aluminum Co. began the development of the Little Tennessee and its tributaries and has built three plants, Calderwood and Cheoah on the main river and Santeetlah on the Cheoah River. Neither Calderwood nor Cheoah have much storage; at Fontana, on the other hand, the proposed 450-ft. high dam will provide 1,300,000 acre-ft. of storage. The dam would be at the upper end of the Cheoah reservoir.

Its stored water can be used in the two plants immediately downstream and in most of the plants on the main river.

Total estimated cost of the dam and reservoir, exclusive of generating equipment, is $29,000,000.

Construction League Endorses Public Works Continuance

A resolution endorsing the continuance of federal aid to non-federal public works in a manner that will not encroach on the field of public construction normally carried on under private enterprise was adopted on March 27 by the Policy Committee of the Construction League of the United States and a special committee was appointed to carry out the policy set forth in the resolution.

The resolution states that in order to insure that relief work and public construction programs of the federal government may be carried out with regard to the welfare of the professions and industries dependent on construction, any such program should be confined to activities and projects of a type that will not encroach on the field of construction normally carried on under private enterprise and employment. It was also pointed out that federal construction projects of substantial and permanent value, especially those that require skilled direction of labor, should to the largest possible degree be administered by the government bureaus and departments normally responsible for those activities and that normal construction procedure should be used.

The resolution further points out that federal aid for public works as has been carried on by the PWA has been of substantial value in maintaining employment in the professions and industries dependent upon construction, and that this aid should not be suddenly discontinued or substantially curtailed at this time when the construction industry is dependent upon such work for a considerable part of its present employment. The resolution also holds that federal aid to municipalities for construction activities should be discontinued gradually, thus providing for a transition from the emergency conditions.

Supports public works bill

In support of these policies the Construction League of the United States endorse the principles presented to the Senate on March 10, 1936, by Senator Hayden, of Arizona, and embodied in a joint resolution introduced into the House of Representatives by Representative Beiter.

The resolution introduced by Mr. Beiter provides for an appropriation of $700,000,000 for useful public works projects to be carried out under the direction of the PWA. These funds would be expended for projects already approved by the PWA.

Section 2 of the resolution introduced into the House of Representatives provides that all contracts let for construction projects and all loans and grants made under this $700,000,000 appropriation shall contain certain provisions as are necessary to insure that no convict labor shall be employed on any project; that, except in executive, administrative, and supervisory positions, the work week shall be limited to 30 hours. The bill also provides that all employees shall be paid reasonable wages sufficient to provide, for the hours of labor as limited, a standard of living in decency and comfort. It also provides that the maximum of human labor shall be used instead of machinery wherever practicable and consistent with sound enonomy and public advantage.

New York Road Program Presented to Legislature

Recommendations for a long range highway development and improvement program were presented to the New York State Legislature on April 2 by the state highway commission. The highway commission has recommended an annual appropriation of $88,000,000 of funds to be obtained by a three-cent gasoline tax and present motor vehicle license fees, supplemented by federal-aid funds, bringing the total to $92,000,000 to be spent on the state's 100,233 miles of road.

The bill introduced into the legislature by the highway commission asks for an

ncrease in the state gas tax from two to three cents per gallon with the entire revenue to be used for highway construction. Construction for safety experimental purposes of 100 miles of sidewalks along state highways and the lighting of 100 miles of highway, also for safety experimental purposes, has been asked by the commission. The bill would also give the state highway department authority to remove billboards and signs where they interfere with the vision of automobile operators. The law would also provide for the state purchase, instead of county purchase, of all land required for highway improvements after July 1, 1937 (*ENR* March 19, 1936, p. 424).

High Water Halts Mississippi Dam Work

After a slow rise throughout the month of March a flood crest is traveling down the Mississippi River from the mouth of the Wisconsin River. The crest on April 5 was near Dubuque, Iowa, where the cofferdam being used by the Maxon Construction Co., Dayton, Ohio, contractor for the construction of Dam 11, has been flooded. The stage, however, at Dubuque and other points in that region has not been sufficient to cause serious flooding of lowlands.

At the sites for Locks 13, 14, and 17, Clinton, LeClaire, and Port Louisa, Iowa, there is also danger that the cofferdams being used in the lock work will be flooded. Work has practically stopped at Lock 13 where the McCarthy Improvement Co., Davenport, has the construction of the lock.

The total snowfall for the winter at the end of March amounted to more than 40 inches in the Rock Island district, a record year. The conditions were very favorable for a serious flood at the beginning of March, but that month proved to be one of below normal precipitation. During April nearly five inches more snow has fallen at Rock Island bringing the winter's total at this point to 45.5 in. As rain continues there the danger from floods still exists. A crest of between 13 and 13.5 ft. was predicted to reach Rock Island, April 7. Flood stage there is 18 ft.

Damages estimated variously from $100,000 to $200,000 were suffered by John Griffiths & Son Co., Chicago, when a cofferdam at lock and dam No. 26 failed during the high water. The cofferdam, a semi-cellular wall composed of individual units of 30x32 ft., was being built in the construction of an auxiliary wall for the locks. Forty cells had been erected and filled with sand when high water occurred. Two or three cells gave way each day until the total number lost was more than 24. When the first cells caved in, a whirley crane and some cars were carried into the river. Soundings taken by the government engineers indicated that the river covered the sunken materials with sand.

When the failure occurred, the river had a current of 6½ to 7 miles with excessively high water. Soundings taken before the collapse showed the depth of the river at that point to be about 40 ft. Subsequent soundings, taken after the collapse, showed a depth of 85 ft. immediately outside the cofferdam section.

Onward Bates Dies, Was Bridge Engineer

Onward Bates, civil engineer, retired, and past president of the American Society of Civil Engineers, died April 4 at his winter home in Augusta, Ga. Born in 1850 in St. Charles County, Mo., he spent two years at Rensselaer Polytechnic Institute with the class of 1875. Later, honorary degrees were conferred on him by R.P.I., the University of Wisconsin and the University of Missouri. For thirteen years he was engineer in charge of bridges and buildings of the Chicago, Milwaukee and St. Paul Railroad and later president of the Bates & Rogers Construction Co.

After attending Rensselaer, Mr. Bates became inspector of iron work on the Eads Bridge, St. Louis, for the contractor and for the Detroit Bridge and Iron Works. In 1874 he became inspector of iron bridges for the Cincinnati Southern Railway under the immediate supervision of Charles L. Strobel, who also died on April 4 as recorded elsewhere in these pages. Mr. Bates then took a similar position with the Chicago, Milwaukee & St. Paul R.R. in 1877. The following year he went to Australia to represent the Edge Moor Iron Works. During the three years he spent in Australia he had supervision of the construction of a number of bridges.

On his return to the United States he served for a time as president of the Pittsburgh Bridge Co., and then after a year in Mexico rejoined the Edge Moor Iron Co. In 1888 he became engineer and superintendent of bridges for the Chicago, Milwaukee & St. Paul R.R., a position he held for thirteen years. He then organized the Bates & Rogers Construction Co., of which he was president until his retirement in 1907. After his retirement he continued to do some consulting work.

Mr. Bates was made an honorary member of the Chicago Engineers' Club in 1932. He was made president of the American Society of Civil Engineers in 1909 and an honorary member in 1923. At one time he had been president of the Western Society of Engineers.

Ely C. Hutchinson Joins J. G. White Corporation

Ely C. Hutchinson, formerly president of the Pelton Water Wheel Co., and editor of *Power*, has joined the staff of The J. G. White Engineering Corp., New York.

Mr. Hutchinson has had a wide experience in the installation and operation of hydro-electric plants and for many years was connected with the Cramp-Morris Industrials, Inc., and was president and general manager of the Pelton Water Wheel Co., San Francisco, from 1926 to 1929. He was also president of the Edge Moor Iron Co., Edge Moor, Del., until 1934.

Mr. Hutchinson is a member of the American Society of Mechanical Engineers, American Society of Civil Engineers, International Electrotechnical Commission, and was a member of the American Committee to the World Power Conference in Berlin. At the present time, he is chairman of the American Society of Mechanical Engineers' Power Test Code Committee for Hydraulic Prime Movers.

Slum Subsidy Housing Bill Introduced In Both Houses of Congress

New Wagner bill provides for long term loans to local housing authorities and a direct grant, either lump sum or patterned after England's rent subsidies—Loans also to be made to limited dividend corporations.

A NEW BILL planned to initiate a permanent policy of federal aid for low cost and slum clearance housing was introduced in Congress last week by Senator Wagner of New York and Representative Ellenbogen of Pennsylvania. It provides for 60-year loans to state or local housing authorities and for a 45 per cent federal grant which may be a lump sum or spread over a fixed period of years similar to Great Britain's rent subsidies. The loans and grants do not cover land purchase. The bill also provides for loans up to 85 per cent but no grants to limited-dividend corporations. While "complete decentralization" is said to be contemplated, the bill permits federal demonstration projects similar to those now being built by the PWA.

The money for loans is to be raised by bond issues of a U. S. Housing Authority consisting of five members, four are to be appointed by the President with Senatorial confirmation; the fifth member is to be the Secretary of the Interior.

Bond issues of $100,000,000 in the fiscal year 1937, and $150,000,000 in each of the three succeeding years are authorized by the bill but alternative provision is made for borrowing $100,000,000 from the Reconstruction Finance Corp.

Mindful that President Roosevelt is not likely to indorse any housing bill involving a large immediate outlay, Senator Wagner limits the first year's appropriation (beginning July 1) to $51,000,000. The bill authorizes but leaves it to a future Congress to appropriate $75,000,000 in 1938 and $100,000,000 in 1939 and 1940.

Enabling legislation will be needed in many states to provide effective application of the federal law. States which have enacted legislation establishing public housing bodies or empowering cities to set up local authorities to undertake housing development include New York, Ohio, Michigan, Illinois, Kentucky, South Carolina, New Jersey, Maryland, District of Columbia, Delaware and West Virginia. The charter provisions of Milwaukee and Los Angeles authorize local commissions to undertake housing projects. Other cities have acted on their own initiative to provide housing agencies.

State bodies for regulating limited dividend housing corporations have been created in Arkansas, California, Delaware, Florida, Illinois, Kansas, Massachusetts, New Jersey, North Carolina, South Carolina, Ohio, and Virginia. Kentucky and California have laws permitting corporations to obtain loans from federal agencies to construct housing.

Charles Strobel, Skyscraper Pioneer, Dies in Chicago

Charles L. Strobel, Sr., consulting engineer, retired, Chicago, died April 4. A pioneer in skeleton steel skyscraper and bridge construction he was born in 1852 in Cincinnati, O. In 1873 he was graduated in civil engineering from the Royal Institute of Technology at Stuttgart, Germany. His early experience was in railway service for the Cincinnati Southern Ry. in charge of designs for bridges on 300 miles of line, including one over the Ohio River. From 1878 to 1885 he was assistant to the president and engineer of the Keystone Bridge Co., becoming consulting engineer and Chicago agent for this company up to 1893. During this period he designed the first standard sections for steel I-beams and channels, introduced Z-bars and Z-bar columns. Bridges designed included some of the well known crossings of the Missouri, Mississippi and Ohio.

From 1893 to 1905 Mr. Strobel was in private practice and then until retirement in 1926 he was president of the Strobel Steel Construction Co. In 1911-12 Mr. Strobel was a vice-president of the American Society of Civil Engineers. He was a member of the Institution of Civil Engineers and the Western Society of Engineers, also a member of the Chicago Plan Commission.

To Restore Bridge at Brunswick, Me.

A contract for raising and restoring the Maine Central Railroad bridge over the Androscoggin River between Brunswick and Topsham, Me., has been awarded by the railroad to the Merritt, Chapman and Scott Company. The bridge, a 6-span structure 877 ft. long, was swept from its piers in the recent flood, halting traffic on one of the two main routes between Portland and Bangor. Reconstruction will require about two months and the estimated cost is about $150,000. Rail traffic is being handled via Lewiston in the interim.

Tornadoes Damage Wide Area in South

Spring storms sweeping through six southeastern states during the past week take heavy property and death toll

TORNADOES, striking widely separated areas in the South from April 2 to April 6, brought death to more than 100 persons and did damage estimated at almost $10,000,000.

At Tupelo, Miss., the storm struck early in the evening of April 5, cutting off power, water and communication lines. Fires broke out, increasing the damage done by the wind, which had cut a swath 250 yd. wide through the residential section. Firemen were hampered in their efforts to control the fires because of the debris-filled streets and damage to the water supply system, which occurred when the municipal water tower was blown over. Damage in this city, where over 134 persons were killed, was unofficially estimated at $2,000,000.

Gainesville, Ga., was severely damaged when a similar storm struck the city, of 8,600 population, during the morning of April 6, doing damage estimated at $5,000,000 and bringing a death toll estimated at 187. The storm, which lasted about three minutes, covered an area 2½ miles long and ¼ mile wide. A number of public buildings were badly damaged and the city hall, which was planned to be replaced soon, was wrecked as were some of the two-story stores and a railroad station. The new federal post office and court house was not damaged but about fourteen blocks of business houses and a small residential district were destroyed. Fires in Gainesville also added to the havoc.

High winds which struck in Florida, Alabama, South Carolina and Georgia on April 2 did particularly heavy damage to Greensboro, N. C., and Cordele, Ga. The storm cut a wide path through the southwest section of Greensboro, killing eleven persons and causing damage of about $1,500,000. Rescue work was hampered by fires and debris. Reasonably substantial buildings were severely damaged by the high wind as can be seen from the accompanying photo. A survey showed that nine industrial plants, 15 stores, and [illegible] residences were demolished and 86 stores, 226 residences and 17 industrial plants partly destroyed.

Cordele, Ga., suffered a property damage of over $1,000,000 when the storm struck shortly before moving on to Greensboro. Eighteen known deaths were reported as a result of the winds which at times reached a reported velocity of 95 miles per hour.

Highway Improvement to be Discussed by MacDonald

Highway improvement policies of federal, state and local agencies will be discussed by Thomas H. MacDonald, chief of the Bureau of Public Roads, U. S. Department of Agriculture, at the annual meeting of the Chamber of Commerce of the United States in Washington, D. C., April 27-30. Among other subjects to be discussed, the topic of rebuilding our cities will be the subject of a round-table conference. The influence of city planning in promoting construction, the development of protection of neighborhoods in the modern city and the relationship of home financing to construction will also be topics at the round-table conference.

British Guiana Seawall Breached by Heavy Seas

A section of the extensive seawall that protects the 200-mi. coast line of British Guiana was severely damaged by high seas on March 25-27 according to Canadian Press reports. A section 1,000 ft. long on the eastern coast of Demerara County, about 11 miles from Georgetown, crumbled on March 25. This breach includes a part of the seawall which was repaired at a cost of $700,000 following the floods of 1934. On March 27 an additional 400 ft. of seawall was washed out. Damage to the seawall and to inundated land was estimated at almost $2,000,000.

SEVERE DAMAGE was suffered throughout the southeast when tornadoes struck several towns and cities. At the left is a building in Greensboro, N. C., which was wrecked on April 2. The other picture shows the business section of Gainesville, Ga., after the storm of April 6.

Brief News

PERMISSION to build one of the first links in the proposed hook-up of the three public power projects being built in Nebraska with PWA funds was granted on March 24 by the Nebraska Railway Commission. The Platte Valley Public Power and Irrigation district was given power to build about 300 miles of transmission lines, most of which will run from North Platte to Columbus, linking the Platte Valley project with the Loup River Public Power district. The application also included a line from North Platte to McCook. The Central Nebraska (Tri-county) Public Power and Irrigation district has applied for permission to build a transmission line from Hastings to Lincoln.

THE BUILDING OF A RAILROAD from Leland to Port Orford, Ore., has been authorized by the Interstate Commerce Commission, on the condition that construction is completed within two years. The road is to be built by the Gold Coast Railroad at a cost of about $4,150,000 and will run through a territory rich in timber and minerals.

DAMAGE to the state road system of Ohio caused by the extreme cold weather of the past winter is estimated to reach $3,000,000 and an additional $1,000,000 is expected to be necessary for repairing highways damaged by the recent floods.

SPENDING of $2,000,000 out of its maintenance fund for the repair of highways damaged by the recent floods has been authorized for the Massachusetts Department of Public Works by a bill enacted on March 26.

SOLVING STOCKHOLM'S TRAFFIC PROBLEMS

Slightly reminiscent of Chicago's Wacker Drive is this cloverleaf intersection in Stockholm, Sweden, which provides for the interchange of vehicle traffic between two streets and a river crossing. In the left background can be seen a rapid transit line which crosses the Maelar River before going underground at the street intersection. Short radius ramps lead traffic from one street to the other.

Federal-aid Highway Bill Reported by Committee

Stressing the need for continued highway construction, the House Committee on Post Offices and Post Roads has reported out the federal-aid bill authorizing $125,000,000 for each of the fiscal years 1938 and 1939. Unless some provision is made for federal-aid expenditures in these years, gasoline taxes will be diverted and the highway problem will be hindered, Representative Cartwright declared in his report.

In reporting the bill to the House, the committee eliminated a provision which would have permitted expenditures of federal-aid funds without matching by states which, by reason of other demands upon their highway revenues for highway purposes, are unable to match their entire apportionment. This exception would have been made in favor of states which the average tax per motor vehicle equals or exceeds the national average.

The committee's bill reduces from $15,000,000 to $10,000,000 the authorization for forest highways, roads and trails in each of the years 1938 and 1939. Authorization of $7,500,000 in each year for construction and maintenance of parkways to national parks and of $4,000,000 in each year for Indian reservation roads was eliminated. The bill also provides for creation of a Section of Rural Roads in the Bureau of Public Roads in conjunction with authorization of $25,000,000 for secondary and feeder roads, including farm-to-market, rural free delivery and school bus routes.

New York Subway Opens New Section

Two additional sections of the city-owned subway in New York City were put into service on April 8. The Fulton St. line in Brooklyn will run from Court St. to Rockaway Ave., and the East River tunnel will connect the recently completed Houston-Essex St. line in Manhattan with the Jay St. station in Brooklyn. The opening of these two sections will complete the system as planned in 1924, with the exception of a section in Queens, the Brooklyn crosstown and the 6th Ave., Manhattan, line. Construction on the first part of the 6th Ave. line from 40th to 47th St. began on March 15, and it is expected that this section will be completed in about 5 years (*ENR*, Feb. 13, 1936, p. 262). The Houston-Essex St. line was opened Jan. 1 (*ENR*, Dec. 26, 1935, p. 900). The Queens and Brooklyn crosstown lines are expected to be finished early in 1937.

Government Provides Funds For Rebuilding Gaging Stations

An allotment of $225,000 was made by President Roosevelt to the U. S. Geological Survey this week for surveys of river stages and discharges during the recent floods and for the rebuilding of stream gauging stations carried away by the torrents. Of the total made available to the survey, $125,000 was drawn from PWA funds to obtain a comprehensive record of flood conditions before the evidence is obliterated by the weather, the growth of vegetation and rehabilitation of affected areas. The balance of $100,000 for replacement and repair of gauging stations was allotted from WPA funds. Appraisal of the extent of damage to the survey's river stations may reveal the need of additional funds to fully restore its facilities.

Interstate Compact Proposed For New England Flood Control

The unprecedented floods in New England, during the week of March 17-26, have brought to the fore a proposal for a four-state compact to prevent repetition of the disaster. Under the plan proposed by the Connecticut State Water Commission, the states of Connecticut, Massachusetts, New Hampshire and Vermont would join in solving problems in regard to New England flood control. Many rivers, such as the Connecticut, which flows through the state of Connecticut, sometimes causing severe damage, have their headwaters in the other states or flow through them, making it difficult for Connecticut to develop local flood control measures. It is believed that the recent floods brought a problem to all of the states which can be best solved by cooperation between them. Some help in this direction is seen in a flood control bill which was introduced into Congress during March. Under the bill a series of ten reservoirs would be built in Vermont and New Hampshire at a cost of about $13,000,000, $5,000,000 of which would be furnished by the federal government, making the cost to the states about $2,250,000 each.

Buzzard's Roost Case Stay Asked to be Vacated

The Government will ask the District of Columbia Court of Appeals to vacate the 40-day stay of mandate which was granted to the Duke Power Company in the Buzzard's Roost case in order to force an immediate appeal to the Supreme Court. Secretary Ickes says that the power company is trying to prevent a decision this session as it had promised to appeal promptly but has not. The appeal must come soon or the case will go over to next fall.

Engineers Report on Montreal Sewage Disposal

The Board of Engineers appointed by the city of Montreal to study the problem of a sewage disposal plant on the Riviere des Prairies running on the north side of the island of Montreal, has now reported its findings. The board explained that the provincial bureau of health had confirmed previous recommendations in regard to the necessity of treating sewage discharged through the north interceptor sewer, at Lille Street, by plain sedimentation or fine screening, followed by chlorination. The board states that this order of treatment is justified, and that it is essential that the city comply with it.

The present population served by the sewer is about 270,000, but the board suggested that allowance should be made for a future population of 350,000, corresponding to a dry weather flow of between 30 and 35 m.g.d. It was also found that it would not be necessary to operate the plant except during the bathing season. The board thus recommends a plant which will cost about $700,000, and estimates the annual charges at $130,000. The treatment recommended consists of plain sedimentation, with a 40 minute period of detention; chlorination, during the bathing season; mechanical dewatering of the sludge; and disposal of the sludge by incineration. The board consists of Paul Beique, W. S. Lea, and J. M. Robertson, all of Montreal.

Commission Proposed to Study Reclamation Projects

Legislation proposing the creation of a commission to investigate the financial and economic condition of the various reclamation projects has been passed by the Senate and reported favorably by the House committee. The proposed commission would consist of three members, appointed by the Secretary of the Interior. Two members would be from the personnel of the Interior Department and one is to be a water user on a U. S. reclamation project.

It is to be the duty of the commission to study each reclamation project separately to ascertain if water right charges can be made without undue burden on the water users or those liable for water right charges.

The bill authorizes the Secretary of the Interior to extend for the calendar year 1936 the relief already granted to water users on Indian irrigation projects. Interest at 2 per cent is to be charged on deferred payments.

Civil Service Tests for Agricultural Engineers

Application for examination as senior agricultural engineer, agricultural engineer, associate agricultural engineer, and assistant agricultural engineer must be on file with the Civil Service Commission, Washington, D. C., by April 20. Competitors will not be required to report for examination but will be rated on their education and experience. Applicants must have been graduated with a degree in engineering, or, for the optional branch of agricultural structures, in architecture, from a college or university of recognized standing. The senior agricultural engineer must have had six years of broad experience in agricultural engineering subsequent to graduation and the agricultural engineer must have had five years of professional experience.

Injunction Restrains Platte Power District

The Platte Valley Public Power and Irrigation district and its officers were enjoined by a temporary injunction granted on March 27 from carrying out the interdistrict contract which provided for an interchange of power between the three Nebraska public power districts. The injunction also prevents the transfer of funds from the Platte Valley district to the joint advisory committee and prevents any officer of the Platte Valley district from serving as a member of this committee.

SOCIETY CALENDAR

SOCIETY OF AUTOMOTIVE ENGINEERS, Milwaukee, Wis., April 15-16. Highway machinery session, April 15.

AMERICAN ROAD BUILDERS ASSOCIATION, annual business meeting, Washington, D. C., April 15-17.

FEDERATION OF ARCHITECTS, ENGINEERS, CHEMISTS AND TECHNICIANS, annual convention, Rochester, N. Y., April 17-19.

CONCRETE REINFORCING STEEL INSTITUTE, annual meeting, Hot Springs, Va., April 20-22.

MIDWEST POWER ENGINEERING CONFERENCE, Chicago, Ill., April 20-24.

AMERICAN SOCIETY OF CIVIL ENGINEERS, spring meeting, Hot Springs, Ark., April 22-24.

NATIONAL LUMBER MANUFACTURERS ASSOCIATION, annual meeting, Chicago, Ill., April 23-25.

MINERAL INDUSTRIES CONFERENCE, research meeting, Urbana, Ill., April 24-25.

NATIONAL RIVERS AND HARBORS CONGRESS, annual meeting, Washington, D. C., April 27-28.

AMERICAN WATER WORKS ASSOCIATION, annual meeting, Los Angeles, Calif., June 8-12.

SOCIETY FOR PROMOTION OF ENGINEERING EDUCATION, annual meeting, Madison, Wis., June 23-26.

AMERICAN SOCIETY FOR TESTING MATERIALS, annual meeting, Atlantic City, N. J., June 29 to July 3.

PUBLIC WORKS CONGRESS, joint meeting, AMERICAN SOCIETY OF MUNICIPAL ENGINEERS AND INTERNATIONAL ASSOCIATION OF PUBLIC WORKS OFFICIALS, Toronto, Ont., September 28-30.

ENGINEERS CLUB OF THE LEHIGH VALLEY, Bethlehem, Pa., April 13. Joseph B. Eastman will speak on transportation.

NEW ENGLAND BUILDING OFFICIALS CONFERENCE, annual meeting, Boston, Mass., April 20-22.

EXAMINATIONS for the registration of professional engineers will be held in:

WISCONSIN—At the office of the State Architect, Madison, April 22-24.

CANADIAN SECTION, AMERICAN WATER WORKS ASSOCIATION, at a recent meeting elected the following officers: Chairman, F. P. ADAMS, secretary-treasurer, A. E. BERRY.

FLORIDA SECTION AMERICAN WATER WORKS ASSOCIATION has elected the following officers: Chairman, KEITH R. CHINN; vice-chairman, DONALD WALLACE; secretary-treasurer, JOHN R. HOY.

BUILDING OFFICIALS CONFERENCE OF AMERICA at its meeting in New York, April 3, elected the following officers: EDWARD W. ROEMER, president; C. M. STEGNER, F. C. KELLER, vice-presidents; WILLIAM F. HURD, secretary-treasurer.

Obituary

FRED GRAY ROSS, for many years prominent engineer and contractor eastern Massachusetts, died at Ipswi Mass., on April 4 at the age of 77. F eighteen years he was on the staff of t Boston & Maine Railroad as a structu engineer.

GEORGE BARTEL, vice-president and rector of the Otis Steel Co., died at home, in Cleveland, Ohio, on April 3. Bartel was born in 1857, and was grad ated from Massachusetts Institute of Te nology, after which he went to Clevela in 1879 and joined the Otis Steel Co.

In 1897 he was made manager and following year president of the compa In 1925 he became vice-president and rector.

ALLISON B. COLLINS, 55, state highwa engineer for the northeast district of Col rado, with headquarters in Greeley, di on March 22 in San Diego, Calif., where he had gone because of his health.

Personals

RALPH J. O'ROURKE, who has been director of the division of operations fo the WPA in Colorado, was appointed fiel engineer in charge of all WPA projects i Colorado, Wyoming and New Mexico RICHARD E. BENNETT, Denver WPA director, succeeds Mr. O'Rourke as head of th division of operations.

R. M. SNELL, formerly engaged in hydraulic construction work for the govern ment of Puerto Rico, has been made resident engineer at Kennett Dam for the Cen tral Valley project in California.

F. EDWARD ARMSTRONG, of Orangeburg, S. C., has been appointed division engineer of the western division of the South Carolina highway department. He was formerly assistant engineer at Orangeburg and associated with the department since 1921. He succeeds BEN R. STROUP, resigned.

CARLTON S. PROCTOR, of New York, has been elected by the Policy Committee of the Construction League of the United States as a representative of the engineers on that committee, to fill the vacancy created by the resignation of ARTHUR S. TUTTLE.

JAMES W. CAREY, has received the appointment as PWA state engineer-inspector for Washington. Mr. Carey will have charge of supervising PWA projects in the state. Mr. Carey, who has been chief engineer for the state of Washington, Department of Public Service for the past three years, had also been chief valuation engineer for the Washington state tax commission for several years, resigning from that position to engage in private practice as a consulting engineer. C. P. DEXTER, consulting engineer of Seattle, will succeed Mr. Carey as chief engineer of the state Department of Public Service.

CARL B. WIRSCHING, president of the Los Angeles, Calif., Board of Public Works, has been named chairman of the general committee for the college of engineering, University of Southern Cali

rnia. He succeeds FRANKLIN S. WADE the Los Angeles Gas and Electric Corp., o served as chairman for the past five ars.

CHARLES E. LEE, JR., has been appointed ssistant director of the materials division of the Tennessee Valley Authority.

LT.-COL. C. P. GROSS, Corps of Engineers, has been relieved from detail as a member of the General Staff Corps, Washington, D. C., and has been ordered to the Engineer School, Fort Belvoir, Va., to serve as instructor, starting Aug. 15.

HAROLD K. BARROWS, consulting engineer and since 1921 professor of hydraulic engineering at the Massachusetts Institute of Technology, was elected president of the Boston Society of Civil Engineers on March 11. Prof. Barrows was retained to investigate the flood problem in Vermont, and is also known as the author of *Water Power Engineering*. He is regional consultant for the National Resources Board, North Atlantic District.

N. S. MACKIE, of Chicago, has resigned as president of Mackie-Thompson-Tamm, Inc., and has organized a new corporation under the name of N. S. Mackie Co., to continue the same type of engineering and contracting work.

ARTHUR J. LINDQUIST, for seventeen years connected with MacDonald Engineering Co., has become associated with the Cement-Gun Construction Co., Chicago.

GILBERT F. MELLIN, of Sacramento, Calif., has been appointed chief right-of-way appraiser to supervise the field work of a group of six appraisers on the Central Valley federal reclamation project. He will receive his directions from the board of appraisers, composed of B. A. ETCHEVERRY, FREDERICK C. HERRMANN and CURTIS WALKER.

CLARKE H. ELDRIDGE, in charge of bridge work for the city of Seattle for several years, has resigned to become Washington state bridge engineer. He succeeds O. R. ELWELL, who died in November.

A. M. TORPEN has been appointed division engineer in charge of the Friant Division of the Central Valley project. Mr. Torpen formerly was construction engineer on the Pickwick Landing Dam for the TVA. OSCAR G. BODEN has been transferred from the Owyhee project to become resident engineer in charge of construction of the Contra Costa Conduit.

CONSTRUCTION STATISTICS FOR THE WEEK

ENGINEERING construction awards are lower this week due principally to lower private awards and a drop in both highway and public building awards. The week's volume is: total, $30,234,000; private, $5,658,000; public, $24,576,000; federal, $721,000; state and municipal, $23,855,000. Corresponding values a year ago are: total $45,052,000; private, $21,514,000; public, $23,538,000; federal, $8,564,000; state and municipal, $14,974,000.

Waterworks and bridge awards are higher this week than last week but other classifications show losses. The values are: waterworks, $3,179,000; bridges, $2,371,000; commercial buildings, $2,401,000; industrial buildings, $1,972,000; public buildings, $6,767,000; street and roads, $8,547,000; sewerage, $836,000; earthwork, drainage, $717,000, unclassified, $3,444,000.

The larger awards for the week include: plant, Mesta Machine Co., Homestead, Pa., $750,000; state office building, Sacramento, Calif., $568,000; high school, Tallahassee, Fla., $400,000; Battin High School, Elizabeth, N. J., $393,000; city-county building, force account, San Diego, Calif., $1,300,000; highways, by Georgia, $898,000; by North Carolina, $837,000; by Wisconsin, $555,000; by Nebraska, $452,000; by Pennsylvania, $511,000; reconditioning waterworks, Cincinnati, Ill., $1,372,000; flood control on Indian Creek, two contracts, Council Bluffs, Iowa, $580,000; park improvements, relief labor, Utica, N. Y., $1,260,000; repairing flood damage, New York Central R.R., including Boston and Albany R.R., in the three states of New York, Massachusetts and Pennsylvania, $750,000.

New capital for the week includes state and municipal bond sales totaling $6,951,000.

CONTRACTS
(Thousands of Dollars)

	Weekly Average Apr. 1935	Prev. 4 Weeks	Week Apr. 9 1936
Federal Government	$4,661	$1,972	$721
State and Municipal	13,972	23,614	23,855
Total public	$18,633	$25,586	$24,576
Total private	10,610	14,398	5,658
Week's total	$29,243	$39,984	$30,234

Cumulative to date:

1935...$377,519,000 1936...$677,040,000

NEW PRODUCTIVE CAPITAL
(Thousands of Dollars)

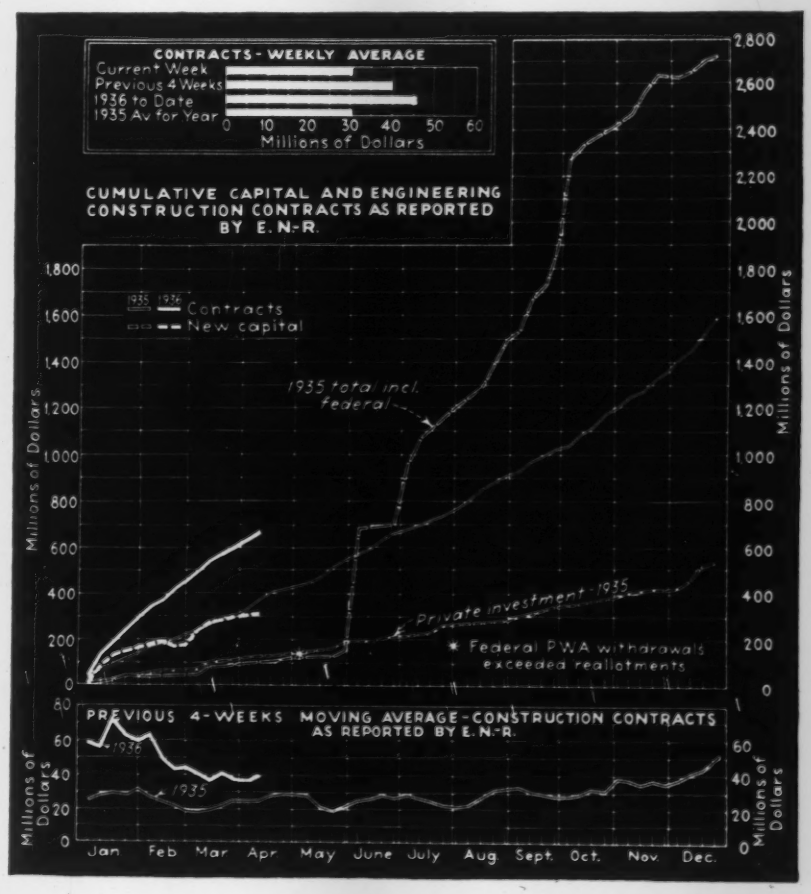
1936	Week Apr. 9	Cumulative
State and municipal	$6,951	$152,003
PWA non-federal	....	49,644
RFC loans	....	25,000
Corporate issues	....	78,545
PWA loans	....	1,270
Total Non-Federal	$6,951	$306,462
Federal	184	4,955
Total new capital	$7,135	$311,417

Cumulative to date:
1935...$101,228,000 1936...$311,417,000

Note: These figures include private bonds, and stocks sold for productive purposes; state and municipal bonds for construction; PWA loans and grants to states and municipalities, including the special highway funds; PWA private loans, and allotments for federal construction, deficiency act funds. An arbitrary percentage (25%) of the WPA allotments and local contributions to WPA work is included to allow for the capital additions through the Works Progress Administration division of the new program.

INDEX NUMBER

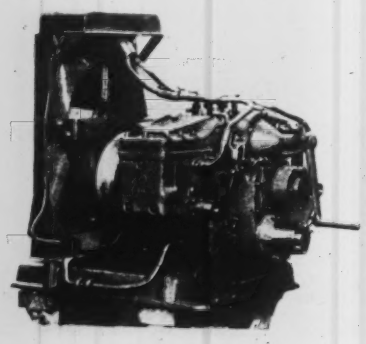
ENR Cost	1913 = 100	1926 = 100	ENR Volume	1913 = 100	1926 = 100
Apr., 1936	202.20	97.20	Mar., 1936	160	70
Mar., 1936	201.20	96.71	Feb., 1936	176	77
Apr., 1935	194.50	93.49	Mar., 1935	101	44
1935 (Av.)	195.22	93.84	1935 (Av.)	135	58
1934 (Av.)	198.10	95.23	1934 (Av.)	114	50
1933 (Av.)	170.18	81.80	1933 (Av.)	102	47



Construction Equipment and Materials

Horizontal Diesel Engine Suited for Many Purposes

A two cylinder, horizontally-opposed diesel engine is now being manufactured and marketed by the Covic Diesel Engine Co., Los Angeles, Calif., under American patents of the Victor Oil Engines, Ltd., Coventry, England. This engine which weighs 280 lb. including a 60-lb. flywheel,



develops from 15 to 18 brake horsepower at speeds from 500 to 3,500 r.p.m.

The Covic diesel is 30 in. wide, 19 in. long and 18½ in. high, and is adaptable for use with electric generators, hoists, compressors, welders, pumps and other equipment. In addition to being available for use as a stationary power plant the Covic engine is also furnished mounted on an automobile chassis of 1-ton capacity, with three or four speed transmission. This engine also furnishes power for a crawler mounted orchard tractor which is made by the same company.

Hauling Unit Designed For Heavy Loads

A six-wheel, 12-yd. dirt hauling unit is now being manufactured by the Hug Co., Highland, Ill. The Model 95 Lugger has been designed into a compact unit by converting the two rear drive axles ordinarily used under a 6-yd. truck into a front and rear wheel drive, and by adding a 6-ton trailer axle as a center axle.

Both front and rear axles are driving axles and are of the double reduction, full floating type, with high traction differential. The center steering axle, mounted between the driving axles, serves not only as a load carrying member, but by steering in tandem with the front driving axle combines load carrying capacity with exceptionally short turning radius. Both front and center-axle steering is air-actuated.

The Model 95 Hug Lugger is available with a 12-yd. scoop-end body, or with a 12-yd. slide-out body. The latter type of body eliminates the use of a power hoist, the four sides of the body slide back off the bed, forcing the load to travel with it.

Large Capacity Portable Compressor

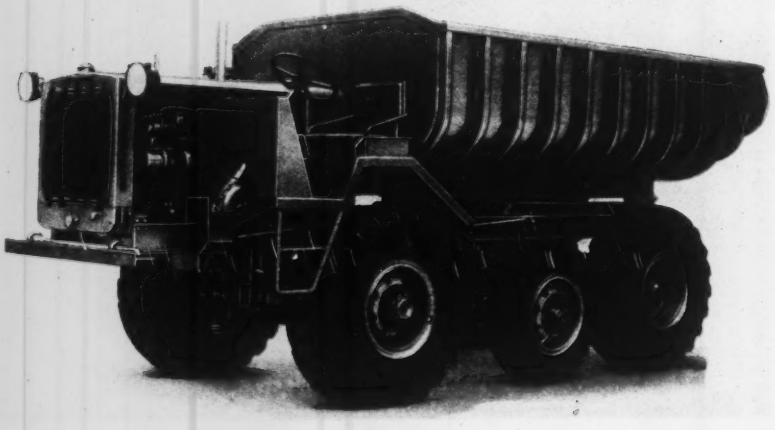
With a capacity of 420 cu.ft. per minute the new diesel portable compressor, made by the Gardner-Denver Co., Quincy, Ill., answers the need for a portable air compressor which can deliver a large amount of air, and yet effect substantial fuel savings. Model ABH 420-D is a two-stage, water-cooled compressor delivering 420 cu.ft. of actual air per minute, on about six gallons of fuel, at full capacity for one hour. The length of the portable compressor, over all, is 16 ft. 7 in. Total weight of the machine is 18,000 lb.

Portable Arc Welder Serves Dual Purpose

A portable engine-driven arc welding machine has been announced by J. D. Adams Co., Indianapolis, Ind. This machine is so mounted that it can be used in the shop or readily taken out for field work.

The Adams arc welder is mounted on steel skids in which form it occupies very little space in the shop during the winter machinery overhauling season. When required for field use the machine can either be hoisted into a truck or mounted on a steel trailer.

A feature of the Adams welder is a remote control switch in the electrode holder which enables the operator to start and stop the engine though his machine may be located several hundred feet away.



New Equipment in Brief

Indirect Lighting System. A new system of lighting, intended for large offices and schoolrooms, and calling for specially constructed arched ceilings, has been installed, for experimental purposes, at the General Electric Company's Nela Park engineering department, Cleveland, Ohio. The system employs nine 250-watt, clear-bulb, incandescent lamps, providing more than 50 footcandles of artificial illumination throughout the room at desk level. By means of the arch type of ceiling, the reflected light is made to come straight down, and little is wasted on the walls. The parabolic arches in the 18-ft.-square room are each about 5 ft. wide and 16 in. deep. The nine lighting units are positioned on about 5-foot squares, and each lamp is so positioned as to be at focus of the parabolic arch.

Emergency Equipment. A velocity type blower for supplying air to men wearing air-line masks in atmospheres deficient in oxygen, has been developed by the Davis Emergency Equipment Co., Inc., New York. The blower has a tangent air outlet, eliminating eddy currents. Two men can be easily supplied with air from this new blower, as it is provided with two hose outlets. The gear housing is cast integral with the blower housing, which insures positive alignment of gears, reduced friction, and decreased wear.

Servicing Tools. Snap-On Tools, Inc., Kenosha, Wis., has developed Snap-On Socket Wrenches and power-duty ratchets for speeding the servicing of heavy-duty equipment, shop machinery, and automobiles. These wrenches are said to save turning time as compared with open-end wrenches. Snap-On Socket Wrenches are made in a wide range of sizes from the $\frac{3}{16}$ in. to the $3\frac{1}{8}$ in. power-duty socket with 36-in. ratchet leverage.

Business Notes

TONCAN CULVERT MANUFACTURERS' ASSOCIATION, Cleveland, Ohio, announces the appointment of a new member, the Tri-State Culvert & Pipe Co., Atlanta, Ga., operated by L. J. Moore, who has had wide experience in the culvert business.

CUTLER-HAMMER, INC., Milwaukee, Wis., manufacturers of electrical control apparatus, announces the appointment of R. J. Eckstein as manager of the Cleveland office.

LINCOLN ELECTRIC CO., Cleveland, Ohio, has moved its Pittsburgh office, formerly at 323 Fourth Ave., to larger quarters at 926 Manchester Blvd.

ATLAS FENCE CO., Philadelphia, Pa., has announced the appointment of Henry F. Anderson, as district sales manager, for eastern Pennsylvania, southern New Jersey and Delaware.

BOYD ANDERSON, for several years sales engineer for the ALLIS-CHALMERS MFG. CO. at Los Angeles, Calif., has been appointed Los Angeles district manager for the company.

CHARLES T. BRAMHALL, sales engineer for GEORGE HAISS MANUFACTURING CO., INC., New York City, died in New York on Feb. 5. Mr. Bramhall will be succeeded by HERBERT PLUEMER, formerly of C. W. Hunt Co.

THE KENSINGTON STEEL CO., Chicago, Ill., announces that FORREST E. SMITH has been elected to the office of secretary.

CONSTRUCTION REPORTS

WATERWORKS

PROPOSED WORK

Calif., Los Angeles — D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 South Broadway, rejected bids Feb. 25, constructing Ivanhoe Reservoir Outlet Tunnel and appurtenant works. Spec. X-13. To readvertise. Noted Mar. 3, C. D.

Calif., Los Angeles—D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 South Broadway, rejected bids Feb. 24, constructing sanitary protection for Hollywood Reservoir. Spec. X-11. Noted Mar. 2, C. D. Will readvertise.

Calif., Santa Cruz—City, R. Fowler, engr., making plans for roof for Bay St. reservoir to have redwood posts and galvanized covering. $60,000. Noted Feb. 20, C.D.—Feb. 27, E.N.-R.

Conn., Willimantic—City, Water Bd., plans reconstruction of dam, Natchaug River, near pumping station in Mansfield. Est. $30,000. T. A. Marcotte, supt. Water Dpt., J. F. Colins, city engr. Noted Nov. 13, C. D.—Nov. 21, E. N.-R.

Me., Skowhegan—Town, A. B. Lamb, water comr., Town Hall, plans water supply system, incl. pipe lines, reservoir, filter plant, standpipe, etc., 1 m.g.p.d. distributing capacity. $84,000. P. W. Malleer, 37 Williams St., New York, engr.

N. Y., Irvington—E. A. Matthiessen, Irvington, plans constructing 30,000 gal. water tank, pump house, for group of proposed new residences. To exceed $23,000. Private plans.

N. Y., Warsaw — Village plans municipal filter plant. $35,000. May apply for federal funds. J. H. Moore, mayor.

N. C., Rural Hall—Town filed application with P.W.A. for $40,000 loan and $32,000 grant to finance construction water and sewerage system.

O., Dennison—City plans purchasing plant and equipment of Dennison Water Supply Co., owned by Community Water Service Co., 100 William St., New York, also supplying water service to Uhrichsville. Negotiations in progress. City will improve and extend facilities. **Maturity indefinite.**

Pa., Lock Haven—Boro plans repairs and replacements to water system, sewers, streets, alleys, public building and equipment at waterworks destroyed or damaged by flood. $252,000. W.P.A. will purchase all material. R. S. Kift, boro engr.

Wash., Asotin—City plans replacing 7,000 ft. watermain within next 2 or 3 years to place system in good condition. J. Forgey, City Hall, engr.

Wash., Bremerton—City plans constructing pumphouse, $25,770. P.W.A. funds awaited. C. C. Casad, City Hall, engr.

Wash., Seattle—City plans 2 mi. watermains in Seaview Ave. from Market St. and 28th Ave. N.W., to West 60th St. $20,000. H. D. Fowler, County-City Bldg., engr.

Wash., Spokane — City plans constructing pumping plant on Hartson, ¼ mi. east of city limits. $330,000. P.W.A. application pending. W. A. Lindsay, Water Dpt., City Hall, engr.

B. C., Kamloops—H. P. Archibald, consult. engr., 448 Seymour St., Vancouver, soon takes bids three deep well pumps of 350 ft. lift, 150 hp. motors, capacity about 1,100 Imp. g.p.m., for pumping station for City. $15,000. Noted Mar. 4, C.D.—Mar. 12, E.N.-R.

Sask., Moose Jaw — Hugh C. Ritchie, city engr., prepares plans constructing 15 m.g. reservoir with necessary connections and lines near Rosedale, for Town. $295,000. Noted Mar. 11, C. D.—Mar. 19, E. N.-R.

BIDS ASKED

†Calif., Farrallon Islands — See "Contracts Awarded."

†Calif., Los Angeles—May 5, by Vet. Bu., Arlington Bldg., Wash., D. C., 2 deep well pumps.

Calif., Sacramento—Apr. 23, by City Council, constructing water storage reservoir at filtration plant, rectangular in plan with rein.-con. walls, floor and a timbered roof, supported by a precast rein.-con. and covered with roofing felt, major amounts of earthwork involved: Reservoir A, 11,000 cu.yd.; Reservoir B, 12,000 cu. yd.; Reservoir C, 13,000 cu.yd.; Reservoir D, 15,000 cu.yd.; Reservoir E, 17,000 cu.yd. Est. $140,000. H. D. Dewell, 55 New Montgomery St., San Francisco, engr. Noted Mar. 30, C. D. —Apr. 2, C. D.

Colo., Olney Springs — See "Contracts Awarded."

Conn., Norwalk—Apr. 20, by City, Sect. A-2, buildings and structures, head house, also water basin, filter, chemical and pumping equipment, First Taxing Dist., 78 Wall St. Est. about $150,000. P.W.A. project. N. S. Hill, Jr., 112 East 19th St., engr. Noted Dec. 27, C. D.—Dec. 17, E. N.-R.

Mass., Boston—Apr. 17, by Commonwealth of Massachusetts, Metropolitan District Comm., R. N. Molt, secy., 20 Somerset St., constructing ashlar-masonry service building and ashlar-masonry head house at Shaft 12 of Quabbin Aqueduct, in connection with Swift River Water Supply Project, Greenwich. F. E. Winsor, c/o owner, ch. engr. Water Supply Division, Boston.

Mass., Haverhill—See "Contracts Awarded."

Minn., Hibbing—Apr. 16, by Village, J. P. Murphy, secy. Water, Light, Power & Building Comm., furnishing, installing complete pumping equipment for 1 well.

Minn., Lafayette—Apr. 15, by Village, V. F. Quist, clk., furnishing, installing pumping equipment for waterworks system and furnishing, constructing 11x14 hollow tile pump house. Druar & Milinowski, 830 Globe Bldg., St. Paul, engrs.

Nev., Caliente—Apr. 24, by Town Bd., replacing and extending distribution system, also replacing supply lines. $50,000. P.W.A. project. A. A. Barr, city engr. Noted Mar. 29, 1935, C. D.—Apr. 4, 1935, E. N.-R.

N. Y., North Tonowanda — See "Contracts Awarded."

Pa., Altoona—See "Contracts Awarded."

Wash., Almira—Apr. 18, by Town Council, drilling well and installing 8 in. I.D. well casing, City raising funds by selling $15,000 worth bonds to pay for above and other improvement work, for which W.P.A. labor has been secured. O. A. Wilde, Spokane, engr. Noted Mar. 14, C.D.—Mar. 21, E.N.-R.

CONTRACTS AWARDED

†Calif., Farrallon Islands—Pub. Wks. Officer, Navy Yard, Mare Island, replacing two 10,000 gal. fresh water tanks, at direction finder station, Spec. 8151, by yard labor. Bids Mar. 25 rejected. Noted Apr. 2, C.D.—Mar. 12, E.N.-R.

Calif., San Diego—City Clerk, strengthening Hodges Reservoir Dam, 10 mi. east of Solana Beach, and about 7 mi. southwest of Escondido, incl. 4,200 cu.yd. concrete, placing about 80,000 lb. reinforcing steel, furnished by city, furnishing, placing about 6,550 bbl. low heat cement, furnishing, placing about 645,000 lb. reinforcing steel, steel rods and steel plates, to M. H. Golden, American Nat. Bank Bldg., $130,613. **P.W.A.** Bids Mar. 10. Noted Mar. 11, C.D.

Colo., Greeley—City Council, 16,000 ft. 26 in. c.i. water pipe to replace main from Poudre Canon to here, to Colorado Fuel & Iron Co., Pueblo, at $3.47 per ft.

Colo., Olney Springs — Town Council, constructing reservoir and pipe line for municipal water system, W.P.A. labor, $52,000.

Ill., West Dundee—Village, 100,000 gal. water tower, to Chicago Bridge & Iron Wks., 37 West Van Buren St., Chicago, $10,850; 75 service meters, to Neptune Meter Co., 310 North Jefferson St., Chicago, $750. **P.W.A.** Bids Jan. 21. Noted Jan. 28, C. D., under "Sewerage and Waste Disposal."

Mass., Haverhill — City, A. Crowell, supt. Water Dpt., City Hall, earthen and concrete reservoir, Bradford Section, day labor. Est. $25,000. **W.P.A.** Metcalf & Eddy, 1300 Statler Bldg., Boston, engrs.

Mass., Norwood—James A. Munroe & Son, general contractors, 159 North Washington St., North Attleboro, steel erecting for iron removal plant, for Town, to E. C. Magoun, 320 Park Ave., Arlington***roofing, to Burgess & Blacher Co., 18 Eustis St., Roxbury***steel and iron, to Brayton-Wilson-Cole Corp., 130 Magazine St., Roxbury***reinforcing steel, to Truscon Steel Co., 38 Chauncy St., Boston***plumbing and heating, to Riley Plumbing Co., 49 Day St.***millwork, to Norwood Lumber Co., East Hoyle St.***stone, to Alexander Thomson, Inc., 36 Albany St., Cambridge***filters and equipment, to Norwood Eng. Co., Florence. Noted Jan. 7, C. D.—Jan. 9, E. N.-R., under "Contracts Awarded."

Minn., Henning — Village, furnishing, installing 50,000 gal. wooden tank on 100 ft. tower, to Challenge Co., Batavia, Ill., $6,389 ***pumping equipment, to Crane Co., of Minnesota, 356 Bway., St. Paul, $1,005***11x14 ft. pump house, to Arnold & Siegstad, Henning, $875. Grand total $8,269. **P.W.A.** Bids Mar. 26. Noted Mar. 11, C. D.—Mar. 19, E. N.-R.

Mo., Galena—City, distribution system and pump house for waterworks, to R. McSweeney, Springfield, $22,219***50,000 gal. steel tank on 40 ft. tower, to Pittsburgh-Des Moines Steel Co., 1015 Tuttle St., Des Moines, Ia., $5,396. **P.W.A.** Bids Mar. 25. Noted Jan. 8, C. D.

N. J., Andover—Boro, hub end valves and hub base hydrant for waterworks, to Mueller Co., 801 West 20th St., New York, $2,519. **P.W.A.** Bids Jan. 8, awarded Jan. 10. Noted Dec. 19, C.D.—Dec. 26, E.N.-R.

N. Y., Carmel—Town, furnishing, delivering c. i. pipe, hydrants, valves, appurtenances for water system, to Camarco Contg., Inc., 11 Mohegan Rd., Ossining. Est. $32,727. **P.W.A.** J. W. Irish, 906 South St., Peekskill, engr.

N. Y., North Tonawanda—City, constructing 6 in. water lines in Zimmerman, Pine, Spruce, Wright and Christiania Sts., relief labor. $26,662. **W.P.A.** E. Nooman, Bailey Bldg., Lockport, procurement officer W.P.A., will purchase materials.

N. Y., Rockville Center—Village, constructing 1 m.g. steel water tank, to Pittsburgh-Des Moines Steel Co., 270 Bway., New York, $84,350. Bids Mar. 19. Noted Mar. 24, C. D.

O., Cardington—Jennings Lawrence Co., engrs., Rowland Bldg., Columbus, constructing iron removal plant on Cardington Waterworks Project, Contr. 4, for City, to Kelso-Wagner Co., 134 West 2nd St., Dayton, $7,400. Est. $8,600. P.W.A. Noted Oct. 21, C. D.—Oct. 24, E. N.-R.

★ **O., Cincinnati**—City, reconditioning waterworks plant, headhouse, constructing additional filters, enlarging capacity from 112 m.g. to 160 m.g.p.d., to Folwell Eng. Co., 333 North Michigan Ave., Chicago, Ill., $1,372,000. Est. $1,250,000 plus. **P.W.A.** Subject to P.W.A. approval at Washington. Noted Mar. 26, C. D. —Apr. 2, E. N.-R.

O., Cleveland—See "Sewerage and Waste Disposal."

O., Lisbon—Village, constructing new mains for waterworks plant, to Gallagher & O'Hara Co., 1816 Wilson Ave., Youngstown, $16,000. Est. $30,000. Fed. Govt. provided $12,797 for materials. Woodward Co., Leetonia, engrs.

O., Russells Point—City, waterworks improvement, Contr. 3, elevated tank, Chicago Bridge & Iron Wks., Rockefeller Bldg., Cleveland, $10,750. **P.W.A.**

O., Union City—Dr. R. W. Reid, pres. Bd. Waterworks Trustee, Control, wells, to Layne Ohio Co., 1100 West Town St., Columbus, $3442 ***Contr. 2, well houses and tank foundations and Contr. 4, piping, to Sweeney & Summers, Piqua, $2,350 and $3,145 respectively***Contr. 3, elevated tank, to Chicago Bridge & Iron Wks., Rockefeller Bldg., Cleveland, $9,025. Grand total $17,962. **P.W.A.** Noted Nov. 16, 1934, C.D.

Ore., Salem—City, excavation for 10 m.g. reservoir for Salem Water Dpt., to Slate Constr. Co., Albany, $14,500. Noted Mar. 19, C. D.

Pa., Altoona—City Council, flood damage repairs and general improvements to municipal water supply system, day labor under supervision of E. Stall, dir. and H. J. Baum, city engr., City Hall. City Council approved plans for $200,575 expenditure. **W.P.A. Maturity soon.** Director E. Stall, authorized to advertise for bids for purchase of materials, incl. c.i. pipe, etc. est $18,399.

Tex., Orange Grove—City, c/o A. Wendt, mayor, waterworks, incl. 75 ft. 100,000 gal. elevated steel tank and tower, two 25 hp. pumps, 18,000 ft. 4- to 6-in. c.i. mains, to Kelly Constr. Co., San Antonio, $32,768; 2 wells, to J. W. Jackson, Houston, $6,028. Est. $46,000. **P.W.A.** Bids Mar. 26. Noted Mar. 9, C. D.—Mar. 12, E. N.-R.

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Reports noted back to former issues are designated as follows:
C. D. Construction Daily
E. N.-R. Engineering News-Record
Federal Government projects symbol †

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NATIONWIDE APPROVAL of Pozzolith

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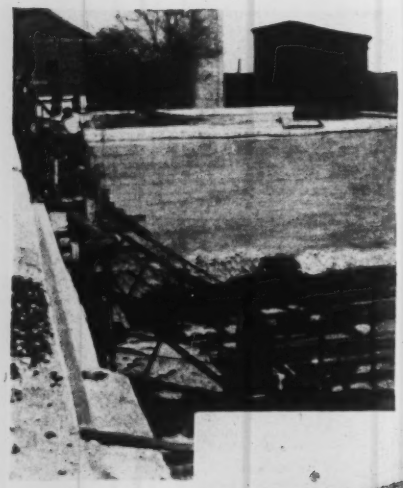

(Above)
St. Charles, Missouri, Filtration Plant. Russell & Axon Engineering Company, Engineers; J. W. Smelser, City Engineer; A. H. Stiel, Inc., Contractor.

(At right)
Main Office and Plant of The Telling Belle Vernon Company, Dairy Products, Cleveland, Ohio. Christian, Schwarzenberg & Gaede, Engineers; Sam W. Emerson Company, Builders.

(At right)
Irondequoit Sewage Disposal Plant, Rochester, N. Y. T. J. Morrison, Commissioner Public Works; M. D. Hayes, City Engineer; H. L. Howe, Supervising Engineer; K. J. Knapp, Assistant Engineer. Contractors: John B. Pike & Son, Inc.

● *Everywhere* . . . engineers are enthusiastically approving POZZOLITH, because it is proving its ability to build *more durable* concrete. See illustrations—typical examples of the many projects where POZZOLITH is building *tougher, better* concrete at *low cost!*

All construction authorities agree that DURABILITY in concrete increases in direct ratio to its density. But to obtain density usually requires a very "dry" concrete . . . so dry as to be impractical in most cases . . . too slow and expensive for modern construction needs. POZZOLITH now makes "dry" mixes practical, lends to all mixes an amazing *increased* workability —with *substantial reduction in water-cement ratio.* POZZOLITH nearly doubles resistance to freezing and thawing; because of its highly efficient pozzolanic activity, POZZOLITH stubbornly resists corrosion in concrete.

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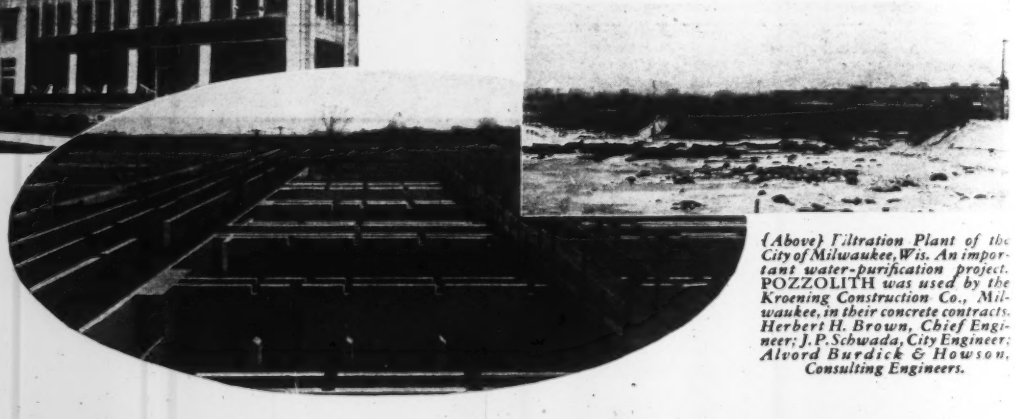

(Above) Filtration Plant of the City of Milwaukee, Wis. An important water-purification project. POZZOLITH was used by the Kroening Construction Co., Milwaukee, in their concrete contracts. Herbert H. Brown, Chief Engineer; J. P. Schwada, City Engineer; Alvord Burdick & Howson, Consulting Engineers.

MASTER BUILDERS

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Waterworks (Continued)

Utah, Eureka—City, constructing filter galleries, developing wells and other underground water sources, to Bernsten & Kuhre, 2336 South 21st St., Salt Lake City, $12,275. **P.W.A.** Part of $52,000 P.W.A. waterworks program. Bids Mar. 20. Noted Mar. 20, C.D.

Wis., Random Lake—Village, constructing well, to R. E. Milaeger, 2325 North 50th St., Milwaukee, $2,800. A. E. McMahon Engr. Co., Menasha, engrs. Bids Mar. 20. Noted Mar. 11, C. D.

SEWERAGE AND WASTE DISPOSAL

PROPOSED WORK

Conn., Essex—Town, preliminary plans sewerage system, incl. mains and disposal facilities, $100,000. N. L. Wright, chn. Sewer Com.

Ill., Hoopeston—City plans constructing sewage treatment plant. Plans to be submitted by July, 1936.

†Ill., Libertyville—Resettlement Administration, Wash., D. C., plans constructing septic tanks and disposal field for Lake County Homesteads.

Minn., Delano—Village, rejected bids Jan. 18, constructing sewage treatment plant, and Feb. 1, for sewers. Noted Jan. 7 and 16, C. D. —Jan. 23, E. N.-R.

N. J., Ocean City—City Comn. plans sewer in Battersea Rd., 16th, 17th and 18th Sts. $46,000. W. A. Collisson, Ocean City, engr.

N. C., Hillsboro—Town filed application with P.W.A. for $53,000 loan and $43,363 grant to finance construction of sewerage system. B. T. Johnson, mayor.

N. C., Rural Hall—See "Waterworks."

O., Columbus—City plans 1,000 ft. 36 in. rein.-con. and 1,000 ft. 18 in. vitr. clay storm sewer, West Third Ave. Dist., Contr. 70, Part 4. Est. $17,000. P. W. Maetzel, City Hall, engr.

Pa., Lock Haven—See "Waterworks."

BIDS ASKED

Ill., Belleville—Belleville Sewer Dist., bids about Apr. 27, sewage treatment activated sludge, $350,000. P.W.A. project. Consoer, Townsend & Quinlan, 205 West Wacker Dr., Chicago, engrs.

Ill., Chicago—Apr. 23, by Sanitary District of Chicago, 910 South Michigan Ave., constructing Div. A, North Side Sanitary Sewer Treatment Works Extension, north of Howard Ave. and west of Mayfair branch of Chicago & Northwestern Ry., in Niles Center. P.W.A. project.

Ill., Chicago—Apr. 16, by Sanitary District of Chicago, 910 South Michigan Ave., furnishing, delivering 55,000 air diffuser plates 12 in. square for Southwest Sewage Treatment Wks., Div. V, in Stickney Twp., Cook Co.

Ky., Louisville—Apr. 23, by Comrs. Sewerage, Marion E. Taylor Bldg., Contr. 94, Brownsboro Road Laterals (laterals east of Vernon Ave., incl. 254 lin.ft. 27 in. plain concrete, 71 lin.ft. 24 in. vitr. clay, and 1,340 lin.ft. 18 in. and 15 in. vitr. clay or concrete pipe sewer.

Mass., Boston—Apr. 16, by commonwealth of Massachusetts, Metropolitan Dist. Comn., W. E. Whittaker, secy., 20 Somerset St., Boston, Sect. 115, North Metropolitan Relief Sewer, Winchester, Woburn and Stoneham, incl. 14,730 ft. concrete sewer. To exceed $250,000. F. D. Smith, ch. engr. Sewer Div.

Mich., Muskegon—Apr. 21, by R. E. Cooper, city clk., sewage treatment plant, 3 sewage lift stations, Beach St. sewer connection. P.W.A. project. Consoer, Townsend & Quinlan, 205 West Wacker Dr., Chicago, Ill., engrs. Noted Mar. 20, C.D.—Mar. 26, E.N.-R.

Minn., Renville—Apr. 13, by City, F. Dunwell, clk., constructing 21,630 lin.ft. 8- to 12-in. sanitary sewerage system, 345 ft. wyes, 64 manholes and flush tanks. $30,000. M. E. Chamberlain, Montevideo, engr. Noted Mar. 5, C. D.—Mar. 12, E. N.-R.

N. Y., Eastchester—See "Contracts Awarded."

N. Y., New York—Apr. 27, by Dpt. Sanitation, 25 Worth St., New York, main sewage and service water pumping units, Contr. C-1; return sludge pumping units, Contr. C-2; excess sludge pumping units, Contr. C-3; motor driven blower units, Contr. D; heating boilers and settings, Contr. H, all for Wards Island Sewage Treatment Works Sect. 3. P.W.A. and W.P.A. project. T. W. Hammond, comr.

N. Y., North Tonawanda — See "Contracts Awarded."

N. Y., Oyster Bay—Apr. 14, by Town Bd., at Town Hall, Audrey Ave., constructing 150 ton per 24 hr. capacity refuse incinerator, $103,179. P.W.A. project. S. B. Bowne, 222 Front St., Mineola, engr. Noted Mar. 19, C. D.—Mar. 26, E. N.-R.

N. Y., Salamanca—See "Contracts Awarded."

N. Y., Utica—See "Contracts Awarded."

Wash., Seattle—See "Contracts Awarded."

S. C., Greenville—Apr. 20, by Greater Greenville Sewer Dist. Comn., constructing 3 secondary units. J. E. Sirrine & Co., Greenville, engrs.

†Federal Government.

CONTRACTS AWARDED

Ia., Tama—City, constructing sewage disposal plant, to Lippert Bros., Boone, $47,300. **P.W.A.** Bids Mar. 6. Noted Feb. 26, C. D.—Dec. 12, E. N.-R.

Md., Frederick—City, constructing 8,000 ft. 23 in. outfall, 10,500 lin.ft. 12- to 27-in. interceptors, 32,300 lin.ft. 8 and 10 in. sewers, 21,000 lin.ft. house connections, to De Lashmutt Bros., Arlington, Va., $239,072. **P.W.A.** Bids Mar. 21. Noted Apr. 2, C.D.—Feb. 20, E.N.-R.

Md., Towson—Baltimore Co. Comrs., Court House, furnishing, laying 11,300 ft. 6 and 8 in. terra cotta sewers, manholes, etc., Rogers Forge (Keelty Development Co.), to Marocco Constr. Co., 231 South Exeter St., Baltimore, $25,376. **P.W.A.** Bids Mar. 16. Noted Mar. 24, C. D.—Mar. 5, E. N.-R.

Minn., Fergus Falls—City, sewage disposal plant, to M. J. O'Neil, 609 New York Bldg., St. Paul, $47,500***intercepting sewer, to H. H. Frankamp, Mankato, $68,400***concrete pipe, to Elk River Concrete Products Co., Elk River, $10,237***vitr. tile, to Elliott & Whitson, Fergus Falls, $6,159***electrical work, to Hintgen-Karst Electric Co., Fergus Falls, $920. Grand total $133,216. **P.W.A.** Bids Mar. 23. Noted Mar. 11, C. D.—Mar. 19, E. N.-R.

Mo., St. Louis—Bd. P. Service, City Hall, 2 garbage grinding units for Dpt. Streets & Sewers, to Williams Patent Crusher & Pulverizer Co., 813 Montgomery St., $6,772. Bids Mar. 10.

N. Y., Eastchester—Village constructing 1,200 lin.ft. 12 in. sewer in Crawford St. and Siwanoy Blvd., relief labor, $35,480. **W.P.A.** D. Jordon, High School, Main St., White Plains, procurement officer W.P.A., will purchase materials.

N. Y., Niagara Falls — F. Canuso & Son, general contractors, 804 South 12th St., Phila., Pa., 739 tons reinforcing steel for sewage disposal plant, for City, to Reecon, Inc., Huron St., Buffalo. **P.W.A.** Noted Feb. 17, C. D.—Feb. 20, E. N.-R.

N. Y., North Tonowanda—City, constructing storm water sewers in Prospect, Schenck, Robinson and Division Sts., relief labor, $41,864. **W.P.A.** E. Noonan, Bailey Bldg., Lockport, procurement officer W.P.A., will purchase materials.

N. Y., Salamanca—Village, constructing 1,300 lin.ft. intercepting storm sewer in Wildwood Ave. and Sycamore Ave., near West Race St., by relief labor, $30,000. **W.P.A.** E. Noonan, Bailey Bldg., Lockport, procurement officer W.P.A., will purchase materials.

N. Y., Utica—City, constructing sewers in north side of Armory Dr. from Madison Ave. to Parkway, $37,883 allotted by W.P.A., total est. $45,000; sewer lines in north side of Armory Dr. from Madison Ave. to Parkway, $11,633 allotted by W.P.A., total est. $16,000, by relief labor. **W.P.A.** D. Mahoney, Hotel St., Utica, procurement officer W.P.A., will purchase materials. J. Shaw, city engr.

O., Cleveland—Great Lakes Exposition, Terminal Tower, constructing water and sewerage system, incl. 14 mi. 8- to 12-in. mains with rest rooms in larger buildings and throughout exposition grounds, to Sweeney & Wise, 10200 Woodland Ave., $50,000. J. P. Jones, sanitary engr. Noted Feb. 17, C.D.—Feb. 20, E.N.-R.

Wash., Seattle — City, constructing outlet sewerage system in 24th to 27th Aves., W., West Dravus to West Berton Sts., W.P.A. labor, $28,000. Council appropriated $6,860 to buy materials. T. R. Beeman, County City Bldg., engr.

Wis., Milwaukee — Metropolitan Sewerage Comn., constructing special section concrete main sanitary sewer in West Kirby Ave., R. O. W. Fisher Parkway, to Wenzel & Henoch Co., 1524 North 27th St., $115,314. Noted Apr. 1, C. D.—Apr. 9, E. N.-R.

BRIDGES AND GRADE CROSSINGS

PROPOSED WORK

★ **Calif., Los Angeles**—C. H. Howell, ch. engr. Los Angeles Co. Flood Control Dist., 205 South Broadway, has presented to Bd. Supervs. a list of railroad bridges to be constructed or reconstructed in connection with U. S. Army Engineer's flood control program in Los Angeles County. Allocation in original plan was for $500,000, but revised estimates show need for $748,000 for work essential to completion of projects. Estimates were prepared by engineers of various railroads concerned and are based in most instances on preliminary design and information, not including those bridges already reconstructed, work to be done includes: first figure shows new estimates, second figure shows amount allowed in original application. Project No. 6, Verdugo Wash, Pacific Electric R.R. at Brand Blvd., new $30,000, $61,000; Project No. 1, Ballona Creek, P. E. R.R. below Washington Blvd., new $25,000 $14,000; P. E. R.R., Inglewood line, new $70,000, $81,000; P. E. R.R. Del Rey line, reconstruction, $196,000, $187,000; Project No. 2, Compton Creek, P. E. R.R., Redondo line, reconstruction, $26,000, $16,000; P. E. R.R., Long Beach line, new $75,000; S. P. R.R., San Pedro line, reconstruction, $106,500; Project No. 19, Rubio Wash, S. P. R.R., Duarte Branch, reconstruction, $6,000; Project No. 9, Rubio Wash, P. E.

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Open Hearth of Nichols Herreshoff Sewage Sludge Incinerator in action.

BURNING

is the only method of ★COMPLETE★ sewage sludge ★DISPOSAL★

The burning of sewage sludge, as accomplished by the Nichols Herreshoff Incinerator, destroys bacteria and organic matter, leaving as a residue a fine, clean, inert ash.

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Duo-Valved—No water wasted in jetting and the steel toothed tip cuts hard material out of the way.

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Sales Office: 90 West St., New York City

Bridges, etc. (Continued)

R.R., San Bernardino line, reconstruction, $26,000; Projects 20 and 32, Alhambra Wash, P. E. R.R., San Bernardino line, reconstruction, $14,000, $52,000; S. P. R.R., main line, new $40,000; S. P. R.R., Duarte Branch, reconstruction, $15,000; S. P. R.R., Duarte Branch, reconstruction, $16,500; Project No. 9, Eaton Wash, S. P. R.R., Duarte Branch, reconstruction, $25,000; P. E. R.R., San Bernardino line, reconstruction, $17,000; S. P. R.R., main line, new $40,000; Project No. 38, Little Dalton Wash., A. T. and S. F. R.R., main line, reconstruction, $15,000; P. E. R.R., spur reconstruction, $5,000. (New indicates new bridge at change from existing location, reconstruction indicates a revision of existing structure to meet new grades, etc.

Calif., San Bernardino—City and Los Angeles Co. plan rein.-con., steel bridge, over Lyttle Creek, Colton Ave. $70,503. P.W.A. project. C. L. Foulke, city engr. J. W. Cole, Court House, co. road comr.

Iowa—State Hy. Comn., Ames, made plans constructing one 180x24 ft. continuous I-beam bridge, incl. 195 cu.yd. Class 1 excav., on secondary road, in Dunkerton, Black Hawk Co. F. R. White, ch. engr.

Louisiana—State Hy. Comn., Baton Rouge, rejected bids Mar. 25, constructing bridge and approaches over Pierre Part Bay, Route 170, Project 1302, Assumption Parish. Noted Apr. 2, C. D.—Mar. 19, E. N.-R.

★ **Massachusetts** — Commonwealth of Massachusetts, Dpt. P. Wks., 100 Nashua St., Boston, and towns of Sunderland and Deerfield, making plans replacing rein.-con., structural steel bridge over Connecticut River, between Sunderland and Deerfield, destroyed by flood. To exceed $500,000. A temporary bridge will be constructed immediately, to exceed $100,000. W. F. Callahan, Dpt. P. Wks., 100 Nashua St., Boston, comr. G. H. Delano, 100 Nashua St., Boston, engr. Noted Mar. 30, C. D.—Apr. 2, E. N.-R.

Mass., Holyoke—City, W. P. Yoerg, mayor and town of South Hadley, making plan repairing concrete abutments, new floor, sidewalks and railings of present 14 span, steel beam bridge over Connecticut River, damaged by flood, $50,000.

Mass., Lancaster—Town, H. Morse, chn. Bd. Selectmen, Town Hall, plans replacing 1 span, steel girder, rein.-con. bridge Central St., and 1 span, steel girder, rein.-con. bridge, Main St., washed out by flood. Est. $50,000 each. Engineer not appointed.

Mass., Leicester—Town, W. J. Belleville, chn. Bd. Selectmen, C. J. Rice, supt. Streets, Town Hall, plans replacing following rein.-con. bridges each about 25 ft. span, at Manville, Auburn and Chappel Sts. and McCarthy Ave., washed out by flood. Est. $15,000 each. Total $60,000. Engineer not appointed.

Mass., Leominster—City, H. W. Burdett, mayor, City Hall, plans replacing 100 ft. span, rein.-con. bridge and approaches over Nashua River, Mechanic St., recently destroyed by flood. $50,000. Commonwealth of Massachusetts, Dpt. P. Wks., G. H. Delano, ch. engr., 100 Nashua St., Boston, probable engr.

Mass., Millbury—Town, P. J. Gibson, chn. Bd. Selectmen, H. A. Taylor, supt. Streets, Town Hall, plans rebuilding rein.-con. bridge over Blackstone River at West St. $40,000; rebuilding rein.-con., steel bridge at Steele St., $15,000, both destroyed by flood. J. J. Gallagher, 25 Brattle St., Worcester, town engr.

Mass., Montague—Town, H. D. Bardwell, clk., Town Office, Turners Falls, plans reconstructing rein.-con., steel Powder Bridge, over Miller River, here, destroyed by flood. To exceed $25,000.

Mass., Southbridge—Town, V. P. Tetreault, chn. Bd. Selectmen, L. Dionne, supt. Streets, Town Hall, plans reconstructing rein.-con. bridges at Centre St., $35,000; Crico St., $15,000, washed out by flood. Engineer not appointed.

Mass., Springfield—City, H. Martens, mayor, City Hall, plans repairing abutments and deck of South End Bridge over Connecticut River, damaged by flood, $50,000. C. W. Phillips, supt. Dpt. Streets & Engineering, engr.

Mass., Sterling — Town, A. Anderson, chn. Bd. Selectmen, Town Hall, plans replacing 35 ft. span, rein.-con. bridge and approaches, 30 ft. wide, Gardner Rd., destroyed by flood. $25,000. Commonwealth of Massachusetts, Dpt. P. Wks., G. H. Delano, ch. engr., 100 Nashua St., Boston, probable engr.

Mass., Sutton—Town, J. Conley, chn. Bd. Selectmen, Town Hall, plans reconstructing 1 span, stone, steel bridge Webster Rd., destroyed by flood, $25,000. J. Dudley, Town Hall, supt. Streets.

Mass., Uxbridge—Town, M. J. Baker, chn. Bd. Selectmen, J. R. Andrews, supt. Streets, Town Hall, plans reconstructing following bridges destroyed by flood, all steel, stone construction, Stenley Bridge, $50,000; Race City Bridge, $20,000; Town Farm Bridge, $12,000; Carding Machine Bridge, $12,000, Tooker Hill Bridge, $35,000. Total est. $129,000. Engineer not appointed.

Mass., Ware—Town, M. L. Jordan, chn. Bd. Selectmen, Town Hall, plans replacing Three Mile Bridge, 2 span, steel beam, over Ware River, destroyed by flood. $25,000.

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Mass., Winchendon—Town, E. J. Dionne, ch Bd. Selectmen, Town Hall, reconstructing span, concrete, steel bridge, Front St. $50,00 1 span, rein.-con. bridge on Route 12, $30,00 destroyed by flood. Engineering will probab be done by Commonwealth of Massachuset Dpt. P. Wks. Engineers.

Mass., Worcester — City, W. Cookson, su Streets, City Hall, plans rebuilding rein.-co structural steel bridge, Southridge St., destroy by flood, $60,000. R. G. Lingley, city engr.

Mo., St. Louis—Bd. P. Service, City Hall, p liminary plans repairing 4 towers and expans bearings, etc. on Grand Blvd. bridge across M Creek Valley. Est. about $25,000. W. C. Becker, city engr.

New Hampshire and Vermont—State of N Hampshire, Concord, F. E. Everett, comr., a State of Vermont, Montpelier, H. E. Sargent, c engr., Montpelier, plan replacing 150 ft. st beam bridge over Connecticut River, betwe Lyme, N. H. and East Thetford, Vt., washed o by flood. $50,000.

N. H., Manchester—City, D. F. Cronin, ch Bd. P. Wks., City Hall, plans replacing old rei con., structural steel bridge (Granite Bridge over Merrimac River, washed out by flood. T exceed $150,000. F. B. Kenney, city engr.

N. J., Mercerville—Mercer Co., Trenton, plan new steel, concrete bridge over creek at Roe Mill, here. $40,000.

N. Y., Corning—City, City Hall, plans repla ing old bridge over Chemung River betwe Bridge and State Sts. $400,000. Engineer n appointed. D. Stimson, mayor.

Pa., Altoona — City plans replacing 4 hi bridges washed away or damaged by flood a following locations: Broad Ave. and 58th St Boulevard, Juniata Sts.; Walnut Ave. and 31 St.; Eldorado and Pine Aves. To exceed $40 000. H. J. Baum, city engr.

Pa., Ebensburg—Comrs. Cambria Co. plan replacing three county highway bridges wipe out by flood, one at Ferndale $270,000, on over Clearfield Creek at Condron $15,000, an other at St. Michael $15,000. Total est. $300 000. Will seek federal funds to finance.

★ **Tex., Port Arthur**—State Hy. Comn., Au tin, and Jefferson Co., plans completed fo superstructure for bridge over Neches River between Port Arthur and Beaumont, 6 mi northeast of here. Total est. $1,670,000. Ash Howard-Needles & Tammon, 1010 Orear Lesli Bldg., Kansas City, Mo., engrs. Noted De 30, C. D.—Jan. 2, E. N.-R., under "Contract Awarded."

★ **Vermont and New Hampshire**—State Hy Dpts. of Vermont, Montpelier, H. E. Sargent ch. engr., and New Hampshire, Concord, F. E Everett, ch. engr., plan replacing rein.-con abutments, structural steel superstructure 4 span 750 ft. bridge over Connecticut River, between Brattleboro Vt. and New Hampshire, destroyed by flood. $500,000.

Vt., Jamaica—Town, H. S. Sherwin, clk., Town Hall, plans reconstructing 1 span, rein.-con., steel bridge, Wardsboro Rd., destroyed by flood. $25,000.

Vt., Whitingham—Town, W. D. Canedy, clk., Town Hall, plans rebuilding 50 ft. single span rein.-con. bridge, Main St., washed out by flood. $20,000-$25,000.

Alta., Slave Lake—Provincial Dpt. P. Wks., W. A. Fallon, minister, making plans constructing bridge over Slave River and other work in connection with town site. $50,000.

Ont., Fort William—City, C. B. Symes, city engr., Canadian Natl. Ry. and Canadian Pacific Ry., T. T. Irving, engr., Union Station, Toronto, plan constructing bridge to carry 6 sets of tracks over Jarvis St. To exceed $100,000.

Ont., Morrisburg—Canadian National Ry., T. T. Irving, engr., Union Station, Toronto, making plans constructing bridge to carry railway over Morrisburg-Ottawa Hy. $105,000.

P. E. I., Charlottetown—Provincial Dpt. P. Wks., J. P. MacIntyre, minister, making plans constructing bridge over North River at Brighton, and bridge over West River at York Point. $200,000.

BIDS ASKED

Arkansas—Apr. 16, by State Hy. Dpt., Little Rock, overpass over M.O.P.R.R., Independence Co., involving 1,202 cu. yd. earth, and 155 cu. yd. solid rock excav. for structures, $60,000. W. W. Zass, 316 Fern St., Little Rock, state hy. engr.

Arkansas—See "Streets and Roads."

Calif., Los Angeles—Apr. 20, by Bd. Supervs. Los Angeles Co., concrete, steel bridges over Southern Pacific R.R., Soledad Canyon Rd., Los Angeles Co. to exceed $23,000. W. D. Armstrong, Hall of Records Bldg., engr.

Iowa—Apr. 14, by State Hy. Comn., Ames, constructing one 180x24 ft. continuous I-beam bridge on secondary road, Dunkerton at C. G. W. Ry. crossing, U.S.W.P. grade crossing WPGM 614-A, Black Hawk Co., incl. 105 cu.yd. excav.; 1 corrugated metal pipe, 3 rein.-con. pipe and 6 rein.-con. box culverts, on Primary Rd. 93, out of Sumner West, 38-GA, Bremer Co., 100 cu.yd. Class 1 excav.; constructing 1 multiple span overhead crossing structure on secondary road, Sect. 23, WPGS-602, Louisa Co., 385 cu.yd. Class 1 and 200 cu.yd. Class 2 excav.;

†*Federal Government.*

bridges, etc. (Continued)

two 60x24 ft. and four 47x24 ft. continuous I-beam bridges, 1 rein.-con. pipe culvert, on Primary Rd. 9, C. R. I. & P. Ry., WPGH-WPGM 110-AC. Lyon Co.; 5 concrete pipe and 6 concrete box culverts, on Primary Rd. 9, from Sibley West, Osceola, 185 cu.yd. Class 1 excav.; rein.-con. rigid frame bridge, on 2nd St., Des Moines, WPMH-321-S, Polk Co., 563 cu.yd. Class 1 excav.; one 24x24 ft. concrete rigid frame grade separation bridge on relocation of U. S. Rd. 6, through Davenport, Scott Co., 185 cu.yd. Class 1 excav.; one 30 ft. rein.-con. arch bridge on same road, 500 cu.yd. channel, 85 cu.yd. Class 1 and 250 cu.yd. Class 2 excav. F. R. White, Ames, ch. engr.

Louisiana—Apr. 15, by State Hy. Comn., Baton Rouge, constructing Black Bayou Bridge No. 2, having ten I-beam spans, each 22 ft. long, 24 concrete roadway, creosoted timber piles with concrete caps, Route 8, Project 1852-A, Caddo Parish.

Louisiana—Apr. 22, by State Hy. Comn., Baton Rouge, constructing rein.-con. steel railroad overpass over Missouri & Pacific R.R. at Pollock, Grant Parish.

Massachusetts—See "Contracts Awarded."

Mass., Fitchburg—See "Contracts Awarded."

Mass., Rutland—See "Contracts Awarded."

Neb., Columbus—Apr. 21, by Secretary Loup River Public Power Dist., 2307 13th St., Columbus, completing steel bridge with concrete center pier and timber trestle approaches to support the tracks of C. B. and Q. R.R. across tailrace canal, near here.

New York—See "Streets and Roads."

★ **New York**—Apr. 17, by Lake Champlain Bridge Comn., Municipal Bldg., Rouses Point, constructing east embankment, and bridge piers of Rouses Point Bridge over Lake Champlain, from Rouses Point, N. Y., to Alburg, Vt. $700,000. P.W.A. project; adv. E. N.-R., Apr. 9. Noted Mar. 19. C. D.—Mar. 26. E. N.-R., under "Contracts Awarded."

N. Y., Saratoga Springs — See "Contracts Awarded."

North Dakota—Apr. 24, by State Hy. Comn., Bismarck, constructing pedestrian underpass in Mandan, WPGM 607, Morton Co., incl. 1,800 cu.yd. unclassified structural excav. W. J. Flannigan, state hy. engr.

North Dakota and Minnesota—Apr. 28, by State Hy. Comrs. of North Dakota and Minnesota, at Court House, Fargo, N. D. constructing 700 ft. Interstate Bridge over Red River of the North, between Fargo, Cass Co., N. D., and Moorhead, Clay Co., Minn., incl. 720 cu.yd. earth excav. W. J. Flannigan, hy. comr., North Dakota, and N. W. Elsberg, hy. comr., Minnesota.

Pennsylvania — Apr. 17, at office W. Van Dyke, secy. Hys., Harrisburg, fabricating, erecting 3 span pony truss bridge and bituminous surfacing crushed aggregate on native stone paving 853 ft. Route 293, Sect. 1, Bedford Co.; fabricating, erecting, deck plate girder underpass and constructing rein.-con. paving, incl. rein.-con. culvert, 745 ft. Route 276, R. 1-A, Cambria Co.; fabricating, erecting, steel truss bridge, encased I-beam underpass, pedestrian underpass, rein.-con. paving 1,635 ft. Route 639, Sect. 8, Westmoreland Co.; bituminous on native stone paving 3,001 ft. Route 19001, Sect. 1, Columbia Co.; rein.-con. paving, rein.-con. arch, extending existing rein.-con. culvert 17,941 ft. Route 238, Sect. 2, Crawford Co.; grading, drainage 6,697 ft. Route 21011, Cumberland Co.; grading, drainage, incl. four I-beam bridges, 14,791 ft. Route 28055, Franklin Co.; grading, draining, 3 rein.-con. structures, 19,091 ft. Route 41086, Sect. 1, Lycoming Co.; bituminous on native stone or crushed aggregate surfacing, incl. 4 timber deck I-beam bridges, 8,288 ft. Route 66004, York Co.; grading, drainage 5,339 ft. Route 66067, York Co.

Tennessee—See "Streets and Roads."

Vermont—Apr. 16, by Missiquoi Bay Bridge Comn., E. T. Bradley, chn., Swanton, approach embankments on Vermont side of Lake Champlain, for bridge over Lake Champlain, P.W.A. Project 1013-R; adv. E. N.-R., Apr. 9. Noted Mar. 18. C. D.—Mar. 5, E. N.-R.

Washington—See "Streets and Roads."

Wisconsin—See "Streets and Roads."

CONTRACTS AWARDED

Georgia—State Hy. Comn., Atlanta, to Way Constr. Co., Valdosta, constructing 4 bridges on Ashburn-Sylvester Rd., Turner Co., $27,992 ***to D. B. Scott, Decatur, bridge over Tabler Creek, Thomaston-Yatesville Rd., Upson Co., $17,202***to R. H. Holz, Atlanta, 1 bridge over Chattooga River, Tri-State Rd., Rabun Co., $17,815***to A. Lyons, Rogersville, Tenn., over bridge and approaches, on Moreland-Newman Rd., Coweta Co., $50,335; 1 bridge Millen-Waynesboro Rd., Burke Co., $2,230; 2 bridges on Douglas-McRae Rd., Coffee Co., $18,867; 1 bridge on Griffin-Fayetteville Rd., Spalding Co., $7,800***to S. B. Slack, Decatur, overhead bridge and approaches, Hawkinsville-Montezuma Rd., Macon Co., $16,923***to Lakey & Anderson, Thomson, bridge on Lincoln-Augusta Rd., Columbus Co., $10,659. Grand total $169,824. Bids Mar. 20. Contracts approved by State Hy. Engineers and awarded subject to approval of Federal Government. Noted Mar. 25, C. D.

†*Federal Government.*

Illinois — Dpt. P. Wks. & Buildings, Div. Hys., Springfield, substructure for viaduct in Ogle Co., to A. P. Munsen, Marion, Ia., $15,017***superstructure for same project, to Milwaukee Bridge Co., 3282 North 34th St., Milwaukee, Wis., $19,994***erecting structural steel for subway under railroad and retaining walls in Cook Co., to W. J. Howard, Inc., 10 South LaSalle St., Chicago, $15,980***substructures and erecting subway structures in Effingham and Fayette Counties, from Condon Cunningham Lemon Co., Kirkwood, Mo., $39,160 ***structural steel for same project, to Stupp Bros. Bridge & Iron Co., 3800 Weber Rd., St. Louis, Mo., $16,953***superstructure bridge in LaSalle Co., to J. T. Riverson & Son, 2558 West 16th St., Chicago, $41,221***substructure for viaduct, Gorham, Jackson Co., to Egyptian Constr. Co., Herrin, $20,257***superstructure for same project, to Mississippi Valley Structural Steel Co., Melrose Park, $18,937***bridge and substructure and erecting structural steel for bridge in Livingston Co., to Empire Constr. Co., Chicago, $35,551***furnishing structural steel for same project, to Wendnagel & Co., 600 West Cermak Rd., Chicago, $5,884***3 bridges and culvert in Ogle and Whiteside Counties, to F. Kaney, Forreston, $24,977. Grand total $253,931. Bids Dec. 6, Jan. 3 and Mar. 3. Noted Mar. 6, C. D.—Feb. 27, E. N.-R.

Indiana—State Hy. Comn., Indianapolis, constructing 30 ft. bridge in Martin Co., to Ryan & Ryan, Washington, $7,751 est. $8,247*** bridge in Shelby Co., to H. Gicks & Son, North Vernon, $84,186 est. $120,178***120 ft. bridge in Hendricks Co., to E. T. Stroh, Gary, $17,435 est. $19,767. Grand total $109,362. Bids Mar. 10. Noted Mar. 31, C. D.—Feb. 27, E. N.-R.

Kansas—State Hy. Comn., Independence, constructing Bridge 15.3 overpass, P. 166-11-WPGH 285-E, Montgomery Co., to List & Clark Constr. Co., Kansas City, Mo., $72,161. Noted Mar. 10. C. D.—Mar. 12, E. N.-R., under "Streets and Roads."

Louisiana—State Hy. Comn., Baton Rouge, constructing bridge and approaches on Bayou Nez Piche on Route 371, Jefferson Davis and Acadia Parishes, Project 1166, to E. L. McCain, Shreveport, $42,588. Noted Apr. 2, C. D.—Mar. 19, E. N.-R.

Massachusetts—Town of Easthampton, W. A. Walker, clk., reconstruction flood area, 1 span steel beam bridge over Mahan River, $10,000*** Town of Douglass, W. Schooster, chn. Bd. Selectmen, reconstructing concrete abutments of bridge, $10,000***Town of Paxton, G. H. Whitney, chn. Bd. Selectmen, reconstructing Spenster Bridge, $10,000***Town of Oxford, H. J. Jendron, chn. Bd. Selectmen, reconstructing abutment of double stone arch bridge, $15,000***Town of Oxford, H. J. Jendron, chn. Bd. Selectmen, E. McKenna, supt. Streets, rebuilding bituminous macadam and gravel roads, $15,000***Town of Uxbridge, M. J. Baker, chn. Bd. Selectmen, J. R. Andrews, supt. Streets, rebuilding bituminous macadam and gravel roads, $15,000, all by day labor. Grand total $75,000.

Mass., Barre—Town, S. C. Chase, chn. Bd. Selectmen, repairing concrete abutments of Powder Mill Bridge, Red Bridge and bridge at Barre Wool Combing Co., all washed out by flood, by day labor. Est. $15,000 or more.

Mass., Fitchburg—City, J. Pierce, chn. Bd. P. Wks., City Hall, replacing abutments of Oak Hill Road Bridge, 70 ft. span, 40 ft. wide steel girder, $25,000; replacing abutments and shore up Pearl St. Bridge, $15,000, destroyed by flood, day labor.

Mass., Rutland—Town, G. R. Willis, supt. Streets, Town Hall, rebuilding 3 frame bridges at Moultons Pond and at mill in West Rutland, destroyed by flood, day labor.

Missouri—State Hy. Dpt., Jefferson City, constructing bridge over Johns Creek, Clay Co., to A. W. Mosley, Platte City; two 35 ft. I beam spans over Mussel Fork, Nodaway Co., to G. Knutson, 3520 Main St., Kansas City. Bids Mar. 13. Noted Mar. 3, C. D.—Mar. 5, E. N.-R.

Missouri—State Hy. Dpt., Jefferson City, constructing rein.-con. deck girder bridge in Livingston Co., to C. H. Atkinson Paving Co., and Condon, Cunningham & Lemmon, Chillicothe, and Kirkwood. Est. exceeds $23,000. Bids Jan. 31. Noted Feb. 6, C. D.

Nebraska—See "Streets and Roads."

New Jersey—State Hy. Dpt., Trenton, grade crossing elimination Comly Rd. and D. L. & W. R.R., Lincoln Park, Morris Co., to Franklin Contg. Co., 20 Wabash Pl., Newark, $109,966 ***Springfield Ave., Berkeley Heights, Morris and Union Counties, to H. L. Harrison & Son, Inc., 1060 Broad St., Newark, $145,832*** Dewey Ave. and D. L. & W. R.R., Wharton and Morris Counties, to F. F. Baker, Upper Montclair, $91,061. Grand total $346,889. P.W.A. Bids Mar. 30. Noted Apr. 1, C. D.—Apr. 9, E. N.-R.

New York—Cauldwell Wingate Co., general contractors, 101 Park Ave., New York, 100 tons reinforcing steel for toll house for Triborough Bridge, connecting Manhattan, Bronx and Queens Boros for Triborough Bridge Authority, 111 8th Ave., to Truscon Steel Co., 1315 Albert St. extension, Youngstown, O. Noted Feb. 20, C.D.—Feb. 27, E.N.-R., under "Contracts Awarded."

N. Y., Saratoga Springs—Bd. Supervs. Saratoga Co., replacing and repairing bridges and highways, destroyed by floods, relief labor.

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Bridges, etc. (Continued)

$86,400. W.P.A. J. F. Leeds, South Street School, Glens Falls, procurement officer W.P.A., will purchase materials.

North Carolina—See "Streets and Roads."

Oklahoma—State Hy. Dpt., Oklahoma City, constructing 160 ft. I-beam on concrete piers in Creek Co., to Gaines Bros., Miami, $52,227 est. $51,916•••50 ft. I-beam bridge, Garfield Co., to Asplund Constr. Co., Enid, $61,989 est. $63,152•••800 ft. I-beam bridge on concrete piers, Major Co., to J. W. Moorman, Hominy, $80,910 est. $85,427•••60 ft. I-beam overpass south of Hominy, Osage Co., to G. H. James, 830 East 15th St., Oklahoma City, $21,745 est. $22,251•••352 ft. bridge in Rogers Co., and 76 ft. bridge, Noweta Co., to Brooks & Dahlgren, Insurance Bldg., Oklahoma City, $35,738 and $5,423 respectively est. $41,057 and $6,300 respectively. Grand total $258,132. Bids Mar. 24. Noted Mar. 17, C. D.

Pennsylvania—See "Streets and Roads."

Rhode Island—Seaboard Constr Co., general contractors, 434 Allens Ave., Providence, and 201 Marginal St., Boston, Mass., 100 tons reinforcing steel for Davisville Bridge, South Kingston, and F. T. Westcott, general contractor, North Attleboro, Mass., furnishing 115 tons reinforcing steel for bridge South Kingston, to Joseph T. Ryerson & Son, Inc., 2558 West 16th St., Chicago, Ill., for State and Providence Plantations, Div. Contracts & Standards, State House, Providence. Noted Mar. 17, C. D.—Mar. 19, E. N-R., under "Contracts Awarded." Bids Feb. 17.

Texas—G. Gilchrist, state hy. engr., Austin, constructing T. and N. O. R.R. underpass and roadway approaches, on hy. Memorial Drive, W.P.G.M. 850-A, Harris Co., to W. R. West, Fort Worth, $57,853 est. $60,000•••constructing T. and P. R.R. underpass, approaches and concrete pavement, rein.-con. bridge Hy. 5, W.P.G.H. 311-E, Red River Co. to C. S. Constant Co., 5750 Marquita St., Dallas, $81,167 est. $80,000•••G. C. and S. Fe R.R. underpass, approaches and concrete pavement Hy. 30, W.P.G.H. 628-A, Burleson Co, to Uvalde Constr. Co., Santa Fe Bldg., Dallas, $67,322 est. $80,000•••G. C. and S. Fe R.R. underpass, approaches and concrete pavement Hy. 2, W.P.G.M. 228-2, Johnson Co., to Brown & Root, Inc., 708 Colorado St., Austin, $48,882 est. $50,000. Grand total $255,224. New **P.W.A.** Bids Mar. 10. Noted Mar. 16, C. D.

Texas—G. Gilchrist, state hy. engr., Austin, constructing I. and G. N. R.R. overpass, Hy. 135, Hy. 64, WPGH 423-D, Smith Co., to J. S. Moore & Sons, Lufkin, $76,876 est. $80,000•••T. and N. O. R.R. underpass, roadway approaches and White Rock Creek Bridge, etc., Hy. 15, WPGH and M. 526-E and F, Dallas Co., to Central Bitulithic Co., P. O. Box 5343, Dallas, $83,336 est. $80,000•••G. C. and S. Fe R.R. underpass, etc., Hy. 7, WPGM and S. 224-E and F, Shelby Co., to Austin Road Co., 1813 Clarence St., Dallas, $66,819 est. $70,000. Grand total $227,031. Bids Mar. 11. New **P.W.A.** Noted Mar. 18, C. D.

Texas—G. Gilchrist, state hy. engr., Austin, constructing T. and N. O. R.R. underpass, roadway and approaches, Hy. 40, WPGH 136-Y, Kaufman Co., to Austin Bridge & Road Co., 1813 Clarence St., Dallas, $44,762. Est. $40,000. New **P.W.A.** Bids Mar. 11. Noted Mar. 17, C. D.

Texas—G. Gilchrist, state hy. engr., Austin, constructing I. and G. R.R. underpass and approaches, Hy. "F," WPSO 828, Travis Co., to Holland Page, Norwood Bldg., Austin, $52,929. Est. $60,000. New **P.W.A.** Bids Mar. 10. Noted Mar. 16, C. D.

Utah—State Road Comn., Salt Lake City, constructing 114 ft. rein.-con. T-beam bridge over Surplus Canal, on Redwood Rd., Salt Lake Co., incl. 18,600 channel and 5,500 cu.yd. structural excav., to Berntsen & Kuhre, 2336 South 21st East St., Salt Lake City, $25,200. Est. $31,705. K. C. Wright, state road engineer.

Wisconsin—See "Streets and Roads."

Wyoming—State Hy. Comn., Cheyenne, constructing 1 overhead crossing over C. & S. R.R., grading, draining 0.428 mi. Chugwater Rd. Project 35 WPGH Platte Co., to Treater & Peterson, Casper, $78,400•••construcing 1 underpass and approaches, Granger, Project 188-G, WPGM Sweetwater Co., to Gibbons & Reed, 165 East 4th St., Salt Lake City, Utah, $80,468•••grading, surfacing, constructing 1 treated timber bridge, 4 rein-con. culverts, 5.12 mi. Osage, Oil City Rd. WPSO Project 281, Weston Co., to Sharrock & Pursel, Casper, $57,387•••landscaping 0.117 mi. Cheyenne streets, USPW Hy. Project NRM 138-E Laramie Co., to Reed & Vandehi, Cheyenne, $10,714•••enlarging 1 rein.-con. culvert, Wheatland, Project 1250, to Goodrich & Mathison, Wheatland, $5,434. Grand total $232,403.

STREETS AND ROADS

BIDS ASKED

Arkansas—Apr. 16, by State Hy. Dpt., Little Rock, grading, drainage, 2 untreated timber bridges, traffic service gravel surfacing 5.1 mi. hy. northeast of Pocahontas County Rd. to Engleberg, Randolph Co., involving 34,862 cu. yd. earth and 930 cu.yd. rock excav., $40,000; grading, drainage, 3 untreated timber bridges, traffic service gravel surfacing 7.3 mi. Hy. 6 and Walnut St., Jackson Co., 27,778 cu.yd. common and 127 cu.yd. dry excav., $40,000; grading, drainage, concrete and asphalt on concrete surfacing 0.2 mi. Intersection of Broadway and 25th Sts., extending north, Pulaski Co., 249 cu.yd. earth excav., $20,000; grading, drainage, traffic service gravel surfacing 0.7 mi. city limits of Batesville east and north on No. 11, Independence Co., 78,240 cu.yd. unclassified, 176 cu.yd. earth and 500 cu.yd. rock excav., $40,000; grading, drainage, 3 untreated timber bridges, traffic service gravel surfacing 7.1 mi. hy. midway on No. 22, north through Prairie View and Scranton to Morrison Bluff, Logan Co., 9,349 cu.yd. unclassified, 183 cu.yd. earth and 962 cu.yd. rock excav., $40,000. W. W. Zass, 316 Fern St., Little Rock, state highway engr.

D. C., Wash.—Apr. 17, by District Comrs., District Bldg., repairing asphaltic pavement with concrete base, incl. 13,500 tons asphaltic material, 9,000 cu.yd. cement, $250,000. Noted Apr. 2, C. D.

Ill., Danville—Apr. 20, by Dpt. P. Wks. & Buildings, Div. Hys., grading, road guard, concrete guttering, culverts, etc., on 1.5857 mi. Sect. 27-1-MFT, Vermilion Co.

Ill., Pekin—Apr. 17, by Dpt. P. Wks. & Buildings, stabilized surface course, grading, etc., 4.2928 mi. Sect. 5-MFT, Tazewell Co.

Iowa—Apr. 14, by State Hy. Comn., Ames, paving 3.212 mi. Primary Rd. 93, in and west of Sumner, F.A.P. 381-GA, Bremer Co.; 1.47 mi. secondary road, from Hansell south to Primary Rd. 10, Franklin Co., incl. 4,686 cu.yd. excav.; 0.326 mi. U. S. Rd. 65, northeast of Iowa Falls, Franklin and Hardin Counties, 80 cu.yd. excav.; 0.334 mi. Primary Rd. 3, north west of Nebraska City, Fremont Co., 805 cu. yd. excav.; 0.303 mi. U. S. Rd. 65, west of Hubbard, WPGH-568-A, Hardin Co., 734 cu.yd. excav.; 0.386 mi. Rd. 30, out of Mount Vernon northwest, WPGH-96-BC, Linn Co., 922 cu.yd. excav.; 0.417 mi. Rd. 18, Ruthven, WPGH-362-D, Rd. 18, Palo Alto Co., 842 cu.yd. excav., grading, graveling overpass approaches 0.461 mi. secondary road in Dunkerton, WPGM-614-A, Black Hawk Co., 96,086 cu.yd. excav.; 0.450 mi. Primary Rd. 175, C. & N. W. Ry. crossing in Jewell, Hamilton Co., 88,086 cu.yd. excav.; 0.255 mi. secondary road, Sect. 23, WPGS-607, Louisa Co., 40,660 cu.yd. excav.; 0.505 mi. Primary Rd. 9, C. R. I. and P. Ry. crossing west of Rock Rapids, Lyon Co., 69,906 cu.yd. excav.; 0.055 mi. Primary Rd. 60, West 2nd St., WPMH-132-C, Polk Co., 7,942 cu.yd. excav.; graveling 5.449 mi. road from U. S. Rd. 71 Audubon Co.; 4.171 mi. secondary road, WPSO-508-C, Clarke Co.; 4.903 mi. secondary road WPSO-441-DE, Fremont and Mills Counties, 0.459 mi. Primary Rd. 175, Hamilton Co.; 14.616 mi. Primary Rd. 175, from Jewell East to Hubbard, Hamilton and Hardin Counties, 1.958 mi. Primary Rd. 175, west of Hubbard, Hardin Co.; 3.444 mi. Primary Rd. 153, Johnson Co.; 7.456 mi. secondary road, Lyons and Osceola Counties. F. R. White, ch. engr.

Kansas — Apr. 21, by State Hy. Comm., Chanute, earthwork, concrete paving, bridging, culverts, light type surfacing, curbing, guttering 7.665 mi. hys. in Neosho, Montgomery, Labette, Greenwood and Bourbon Counties.

Kentucky — Apr. 17, by State Road Dpt., Frankford, grading, draining 4.564 mi. Petersburg-Anthoston Rd., W.P.S.O. 410 A-G, Henderson Co.; 2.104 mi. Inez-Louisa Rd., W.P.S.O. 431 A-G, Martin Co.; 1.126 mi. Jackson-Booneville Rd., W.P.S.O. 442 A-G, Owsley Co.; medium type surfacing 1.234 mi. Tennessee St. in Paducah (Old Mayfield Rd.), W.P.M.S. 489 A-S, McCracken Co.; 0.614 mi. Main St., in Nicholasville, W.P.M.S.S. 377 A-S, Jessamine Co.

Louisiana—State Hy. Comn., Baton Rouge, rejected bids Mar. 25, grading, gravel surfacing 6 mi. Mamou-Fenris Hy., Route 221, Project 1119, Evangeline Parish; grading, local iron ore surfacing 4.3 mi. Intersection Route 23-Intersection Route 576, Hy. Route 546, Project 1132, Evangeline Parish; grading, drainage structures 8.277 mi. Weeks-Island Lydia Hy., Route 157, Project 1014, Iberia Parish. Noted Apr. 2, C. D., under "Low Bidders."

Maryland—Apr. 14, by State Roads Comn., Baltimore, 1.51 mi. traffic bound macadam paving, along Loch Lynn Gorman Rd. from end of Contr. G-59 to Kelson Gap, Contr. G-100-1-62, Fed. Aid Project WPH 246-B, Garrett Co.

Md., Baltimore — Apr. 15, by Bd. Awards, grading, concrete paving 4,000 sq.yd. Footway Repair Contr. 124, and Alley Repair Contr. 149.

Md., Baltimore — Apr. 15, by Bd. Awards, 1,650 sq.yd. granite block, paving city streets, Contr. 663, 7,150 sq.yd. sheet asphalt paving city streets, Contr. 664. Bureau Hys., Municipal Bldg., engrs.

Massachusetts—Apr. 14, by Commonwealth of Massachusetts, Dpt. P. Wks., W. F. Callahan, comr., G. H. Delano, ch. engr., 100 Nashua St., Boston, bituminous macadam paving 4,232 ft. Ocean Ave., Revere (double car track 18 ft. wide to be paved with granite blocks). To exceed $100,000.

Mass., Auburn—See "Contracts Awarded."

Mass., Bolton—See "Contracts Awarded."

Mass., Dudley—See "Contracts Awarded."

Mass., Fitchburg—See "Contracts Awarded."

Mass., Harvard—See "Contracts Awarded."

Mass., Leicester—See "Contracts Awarded."

†*Federal Government.*

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Streets and Roads (Continued)

Mass., Leominster—See "Contracts Awarded."

Mass., Millbury—See "Contracts Awarded."

Mass., Northbridge—See "Contracts Awarded."

Mass., Spencer—See "Contracts Awarded."

Mass., Sutton—See "Contracts Awarded."

Mass., Winchester—See "Contracts Awarded."

Minnesota—Apr. 17, by State Hy. Dpt., St. Paul, paving 10 mi. State Project 61-3-24-1B and 2, Federal Aid Project 418 A, B and C, between 4 mi. east of Lake City and Wabasha, incl. 80,833 cu.yd. excav.; 6.9 mi. S.P. 75-6-32-2C, FAP 343 B, between Doran and Breckenridge, 93,837 cu.yd. excav.; 1.6 mi. S.P. 75-6-30-1C, 75-6-30 and 76-6-39-2D, FAP 333 A and B, 10,784 cu.yd. excav.; 4 mi. S.P. 75-5-57-2 and 75-6-57-1A, FAP 163, 4 mi. between Luverne and 4 mi. north, 47,272 cu.yd. excav.; grading 10.6 mi. S.P. 28-28-26-1 and 28-28-24, FAP 240 and 200, between 3.5 mi. west of Beardsley and Graceville, 284,404 cu.yd. excav.; 6.7 mi. S.P. 59-17-30-2, FAP 75, between Avoca and Fulda, 151,393 cu.yd. excav.; 4.1 mi. S.P. 66-85-22-1, FAP 523 D, between 2 mi. southwest of Brewster and east Nobles Co. line, 98,877 cu.yd. excav.; 2.3 mi. S.P. 152-129-24, FAP 473, in Clearwater, 144,906 cu.yd. excav.; 9.3 mi. S.P. 169-35-21, FAP 245, between Bennettville and Aitkin, 223,854 cu.yd. excav., 7,623 cu.yd. sub-grade excav.; 4.4 mi. S.P. 169-35-23-2B, between Junction Trunk Hy. 18 and Bennettville, 77,673 cu.yd. excav., 2,028 cu.yd. sub-grade excav.

Neb., Lincoln—Apr. 15, by City, City Hall, paving and curbing 2nd St., A to F Sts., Dist. 850, $27,000; and 0.5 mi. 33rd from Holdredge to Leighton Sts., Dist. 742, $39,500. D. L. Erickson, city engr.

Nevada—Apr. 15, by State Hy. Comn., Carson City, gravel or crushed stone surfacing 3.12 mi. road between Tonopah and point 3 mi. east of Route 4, Sect. A1, Nye Co.; asphaltic road-mix surfacing 24.21 mi. road between point 3 mi. north of Springdale and point 6 mi. south of Stonewall Pass, Nye Co.; 12.25 mi. road between Alamo and Crystal Springs, Route 7, Sect. B1, Lincoln Co.; 20.86 mi. road between Coaldale and Rhoades, Mineral Co. R. A. Allen, Carson City, engr.

New Jersey — Apr. 20, by E. D. Sterner, comr. State Hy. Dpt., Trenton, widening, rein.-con. paving 0.45 mi. Routes 21, 25 and 29, Sect. 11B, Newark Junction, Essex Co., incl. 1,604 cu.yd. roadway unclassified excav.; adv. E. N.-R., Apr. 9.

N. J., Trenton—Apr. 14, by City Manager, sheet asphalt repaving Princeton Ave., Allen, Ferry and Union Sts.; granite block paving Warren and Chauncey Sts. J. E. English, City Hall, engr.

New York—Apr. 17, by Dpt. P. Wks., Albany, concrete paving 2.79 mi. road in Nassau Co.; bituminous macadam paving 1.28 mi. and 20.6 mi. roads in Queens Co. F. S. Greene, supt.

New York—Apr. 21, by Dpt. P. Wks., Albany, graveling, bituminous treating 6.93 mi. road in Livingston Co.; macadam paving 0.4 mi. Cattaraugus Co.; 6.11 mi. Livingston Co.; constructing two 195 ft. span truss bridge and 36 ft. I-beam span bridge in Broome Co.; 30 and 50 ft. I-beam bridges in Chenango Co.; 20 ft. slab span and approaches 0.11 mi. road in Cortland Co.; 76 ft. girder with two 20 ft. and one 23 ft. concrete beam approach spans over New York Central R.R. Co., Putnam Co.; 114 ft. girder bridge carrying Delaware & Hudson R.R., Schenectady Co.; 30 and 50 ft. I-beam spans on 0.38 mi. road in Yates Co. F. S. Greene, state supt.; adv. E. N.-R., Apr. 9.

N. Y., Albany—See "Contracts Awarded."

N. Y., Herkimer—See "Contracts Awarded."

N. Y., Johnstown—See "Contracts Awarded."

N. Y., Lloyd—See "Contracts Awarded."

N. Y., Marshall—See "Contracts Awarded."

N. Y., New Rochelle — See "Contracts Awarded."

N. Y., Peekskill—See "Contracts Awarded."

N. Y., Rome—See "Contracts Awarded."

N. Y., Saugerties—See "Contracts Awarded."

N. Y., Syracuse—See "Contracts Awarded."

N. Y., White Plains — See "Contracts Awarded."

Oklahoma—State Hy. Dpt., Oklahoma City, received no bids Mar. 24, improving roads in McCurtain, Creek, Lincoln and Osage Counties, $73,426. V. T. Moon, state hy. engr. Noted Mar. 17, C. D.

Pennsylvania—See "Bridges and Grade Crossings."

Pa., Dunmore—Apr. 24, by Boro Council, repairs to various paved streets; Apr. 28, bituminous paving various streets, $296,000, W.P.A. project. Samuel Mastriana, boro engr.

Tennessee—Apr. 17, by State Hy. Dpt., Nashville, grading, drainage, paving 0.595 mi. State Hy. 1, between F.A.P. 21, Project WPGH 21, Part 11, Fed. Aid Project 21, Carroll Co.; 2.354 mi. State Hy. 1 from Crossville toward Dorton, U. S. Wks. Project WPH 299-B, Cumberland Co.; grading, drainage 3.229 mi. State Hy. 2, between Rutherford County Line and Noah's Fork Creek, U. S. Wks. Project WPH 208-H, Coffee Co.; 2.662 mi. State Hy. 1, from Knox Co. line toward Rutledge, U. S. Wks. Project WPH 210-C, Grainger Co.; 4.947 mi. Non-System Hy. between State Hy. 10, Bell Buckle, U. S. Wks. Project WPSO 436-A and WPMS 436, Bedford Co.; paving 5.121 mi. State Hy. 78, between Tiptonville and Kentucky State Line, U. S. Wks. Project WPSS 413-B, Lake Co.; constructing and paving overhead and approaches 0.548 mi. over N. C. & St. L. R.R., State Hy. 1, near Hollow Rock, U. S. Wks. Grade Crossing Project WPGH 21, Part 11, Carroll Co.; constructing overhead and approaches 0.524 mi. over Tennessee Central R.R., State Hy. 24, Cookeville City, U. S. Wks. Project WPGH 229-C and WPGM 229-D, Putnam Co.

Washington—Apr. 21, by L. V. Murrow, dir. Hys., Olympia, concrete and asphaltic concrete paving and constructing concrete sidewalks 2.5 mi. State Rd. 9, First St. between Lincoln and Race Sts., in Port Angeles, U. S. Wks. Project WPMH 138-B, 166-B, 54-G and 54-B, Clallam and Grays Harbor Counties; concrete paving 0.4 mi. State Rd. 21, Sixth St. from Naval to Veneta Sts., Bremerton, U. S. Wks. Project WPMH 175-D, Kitsap Co.; concrete paving, 0.3 mi. and constructing rein.-con., steel approach spans State Rd. 3, Pasco Kennewich Bridge, Revision, Fed. Aid Project 194-A, Franklin and Benton Counties, incl. 28,290 cu. yd. excav.; clearing, grading 0.5 mi. and constructing treated timber deck truss bridge County Rd. Morton Bear Canyon, U. S. Wks. Project WPSO 248-A Lewis Co., incl. 35,680 cu. yd. excav.; grading, surfacing 0.02 mi. and constructing concrete steel undercrossing tracks O. W. R. R. & N. Co. County Rd. undercrossing O. W. R. R. & N. Co. tracks on Darknell Rd. U. S. Wks. Project WPGS 281-A, Spokane Co. 2,750 cu.yd. excav. grading, asphaltic concrete paving, bituminous road mix and bituminous plant mix surface treatment 0.4 mi. and rein.-con. bridge City St., city of Walla Walla, U. S. Wks. Project WPMS 290-A Walla Walla Co.; cement concrete paving, cement concrete and asphaltic concrete sidewalks on 2.251 mi. and treated pile, timber trestle County Rd., Black River Junction to Renton, U. S. Wks. Project WPSO 244-A, WPMS 244-B and WPGH 244-C unit 2, King Co., incl. 159,405 cu. yd. excav.; constructing 0.263 mi. steel, concrete, treated timber overcrossing, County Rd. Railroad Overcrossing Black River Junction U. S. Wks. Project WPGS 244-C, Unit 1, King Co., 1,150 cu. yd. excav.

Wisconsin—Apr. 17, by State Hy. Comn., Madison, grading, draining, concrete surfacing 0.287 mi. South Eighty-Fourth St. subway, County Trunk Hy. UU, U. S. Wks. Project WPGM 728, Milwaukee Co., incl. 33,057 cu. yd. excav.; grading, draining 1.202 mi. city streets of Peshtigo, County Trunk Hy. D, U. S. Wks. Project WPMS 707, Marinette Co., 5,827 cu.yd. excav.; 5.267 mi. Delavan Whitewater Rd. U. S. Hy. 12 Sect., U. S. Wks. Project WPSO 689, Welworth Co., 117,925 cu.yd. unclassified excav.; 0.615 mi. Fond du Lac Oshkosh Appleton Rd. Belt Line overhead approaches, Town Road and U. S. Hy. 41, U. S. Wks. Project WPGH 582-E, Winnebago Co., 273,289 cu.yd. common and borrow excav.; 1.97 mi. Junction City Dancy Rd., U. S. Wks. Project WPSS 622, Portage Co., 29,622 cu.yd. common and borrow excav.; 0.484 mi. Antigo Eagle River Rd., Gazen Three Lakes Rd., U. S. Hy. 45, U. S. Wks. Project WPH 380-E, Oneida Co., 51,421 cu.yd. common and marsh excav.; gravel surfacing 3.292 mi. Monticello Evansville Rd., County Trunk Hy. G, U. S. Wks. Project WPSO 642-B, WPMS 642-C, Green and Rock Counties; 1.202 mi. city streets of Peshtigo, County Trunk Hy. D, U. S. Wks. Project WPMS 707, Marinette Co.; 1.484 mi. Antigo Eagle River Rd., Gazen Three Lakes Rd., U. S. Hy. 45, U. S. Wks. Project WPH 380-E, Oneida Co.; 1.97 mi. Junction City Dancy Rd., Trunk Hy. 34, U. S. Wks. Project WPSS 622, Portage Co.; grading, gravel or crushed stone surfacing 11.637 mi. State Line County Trunk Hy. T and G, U. S. Wks. Project WPSO 640 and WPSO 641, Green Co., 9,609 cu.yd. common and borrow excav.; grading, draining, gravel surfacing 0.53 mi. Wisconsin Dells Oxford Rd., Town Rd., U. S. Wks. Project WPSO 632, Adams Co., 8,303 cu.yd. common excav.; 1.369 mi. Clintonville Rosholt Rd. County Trunk Hy. C, U. S. Wks. Project WPSO 717-A and WPMS 717-B, Waupaca Co., 9,352 cu.yd. common and borrow excav.; 1.51 mi. St. Croix Falls Superior Rd., U. S. Wks. Project WPH 188, Burnett Co., 98,784 cu.yd. common and marsh excav.; 1.674 mi. Sheldon Conrath Rd. County Trunk Hy. G, U. S. Wks. Project WPSO 677, Rusk Co., 25,085 cu.yd. common and borrow excav.; 0.37 mi. Manitou Falls Superior Rd., Saunders Grade Separation, State Trunk Hy. 35, U. S. Wks. Project WPGH, Douglas Co., 441 cu.yd. unclassified excav.; 0.435 mi. Manitou Falls Superior Rd., South Superior Grade Separation, State Trunk Hy., U. S. Wks. Project WPGH 201-C, Douglas Co., 109,850 cu. yd. borrow and 569 cu.yd. unclassified excav.; grading, draining 1.306 mi. and constructing rein.-con. culvert and timber, concrete and I-beam structure, Barron Turtle Lake-St. Croix Rd., Shiloh School Turtle Lake Rd., U. S. Hy. 8, U. S. Wks. Project WPH 22, Polk Co., 92,597 cu.yd. common and marsh excav.; grading, draining, concrete base approaches and new structure and center pier 0.106 mi. Milwaukee

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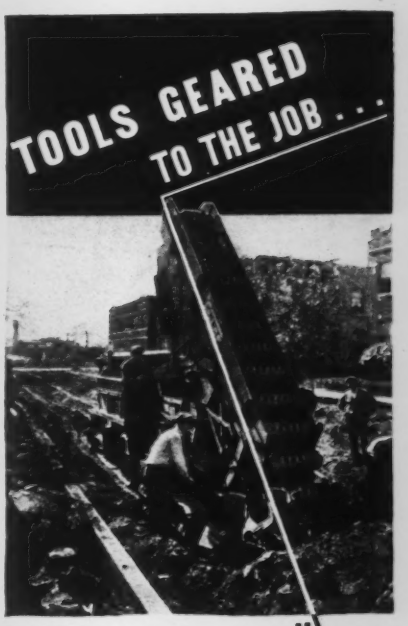
†*Federal Government.*



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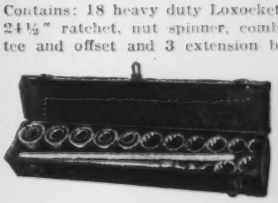

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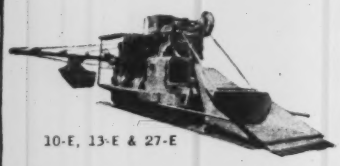

10-E, 13-E & 27-E

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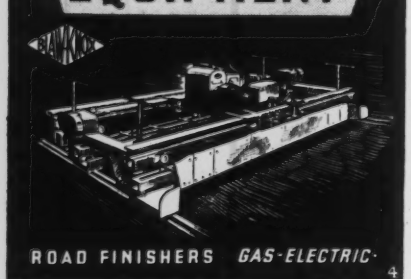

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Streets and Roads (Continued)

Chicago Rd., South Twenty-Seventh Street Overhead Sect., U. S. Hy. 41, U. S. Wks. Project WPGM 378-G, 1,463 cu.yd. common excav.; constructing 1 overhead structure and rein.-con. culvert, Fond du Lac Oshkosh Appleton Rd., Belt Line Overhead, U. S. Hy. 41, U. S. Wks. Grade Crossing Project WPGH 582-E, Winnebago Co., 1,045 cu.yd. structure, earth, borrow, marsh and channel excav.; constructing Bridge 68, six 25 ft. 2 in. spans and two 24 ft. 7 in. spans, timber, steel and rein.-con. deck, Three Lakes Argonne Rd., town of Three Lakes, State Trunk Hy. 32, State Project 7002, Oneida Co.; one deck truss structure, four 75 ft. spans, St. Croix Falls Superior Rd., Danbury North County Line Rd., State Trunk Hy. 35, U. S. Wks. Project WPH 188, Burnett Co., 490 cu. yd. structure excav.

Wis., Kenosha—Apr. 15, by City, improving west approach of 5th St. bridge incl. rockfilling, piling, reinforcing, grading, etc. C. Whitney, 724 East Mason St., Milwaukee. Noted Mar. 13, C.D.—Mar. 19, E.N.-R.

N. S., Halifax—Apr. 15, by A. S. MacMillan, minister Hys., reconstructing 8.5 mi. Evanston Rd. to Port Hawkesbury, 9.5 mi. Grand Anse to Evanston Rd.; Apr. 13, 8 mi. Central Argyll to Ell Brook, 9.6 mi. East Pulmico to Central Argyll, 8.1 mi. Forbes Point to Oak Park Rd.; Apr. 11, 5.8 mi. Roundhill Bridge to Annapolis East, 7.9 mi. Bridgetown West to Roundhill Bridge. $350,000.

CONTRACTS AWARDED

Arizona—State Hy. Dpt., Phoenix, aggregate base course and cut back oil cake paving Kingman-Boulder Dam Hy., to N. G. Hill & Co., 1145 West Culver St., Phoenix, $142,156. Bids Mar. 13. Noted Mar. 27, C. D.—Mar. 5, E. N.-R.

California—State Hy. Comn., Sacramento, grading, oiling 8 mi. hy. between Kelshaw Corners and Coarse Gold, Madera Co., to R. R. Carlson, Weber Ave. and E St., Stockton, $194,385; plant mixed on crusher run surfacing 2.6 mi. hy. between Napa city limits and Napa Wye, Napa Co., to A. G. Raisch, 1 De Haro St., San Francisco, $38,375. Bids Mar. 25, awarded Mar. 31. Noted Mar. 27, C. D.

★ **Georgia**—State Hy. Bd., Atlanta, grading 2.296 mi. Lincolnton-Augusta Rd., Columbia Co., and 6.368 mi. Toccoa-Clarksville Rd., Habersham Co., to C. M. Lyle Constr. Co., Gainesville, $19,133 and $51,579 respectively ***6.666 mi. Butler-Reynolds Rd., Taylor Co., and 8.545 mi. Sylvester-Tifton Rd., Tift Co., to J. Monaghan, Inc., Pelham, $38,636 and $54,562 respectively***4.319 mi. Atlanta-Jonesboro Rd., Clayton Co., to A. P. Milam, Decatur, $37,945***paving road and constructing underpass 0.338 mi. Marietta-Atlanta Rd., Fulton Co., to Southeastern Eng. Co., Atlanta, $134,579***paving and widening 1 bridge 7.84 mi. Toccoa-Elberton Rd., Stephens Co., to R. T. Smith, Tallapoosa, $112,828***grading, 5.782 mi. Douglas-McRae Rd., and grading, 1 bridge 0.306 mi. Graymont-Millen Rd., Jenkins Co., to Coffee Constr. Co., Eastman, $32,445 and $17,259 respectively***paving 0.498 mi. Atlanta-Newnan Rd., Fulton Co., to Schley Gordy & H. McMath, Columbus, $44,669***paving 6 mi. La Grange-Franklin Rd., Troup Co., to Claussen-Lawrence Constr. Co., 1394 Gwinnett St., Augusta, $118,931***7.512 mi. Jackson-Monticello Rd., Butts Co., to Hardaway Constr. Co., 15 11th St., Columbus, $113,421*** paving, and 1 bridge 0.063 mi. Atlanta-Burford Rd., Fulton Co., to Pennell & Harley, Inc., Spartanburg, S. C., $25,538***0.377 mi. same road to W. F. Bowe, Jr., Augusta, $69,406*** grading, 1 culvert type bridge 4.7 mi. Nahunta-Jesup Rd., Brantley Co., to L. Knabb Constr. Co., Macclenny, Fla., $27,203. Grand total $898,134. Bids Mar. 20. Contracts approved by State Highway Engineers and awarded subject to approval of Federal Government. Noted Mar. 25, C. D.

Illinois—Dpt. P. Wks. & Buildings, Div. Hys., Springfield, widening, paving 0.54 mi. Route 15, Sect. 20Z-WPMH, Main St. from west city limits to 1st St., in Fairfield, Wayne Co., to French Constr. Co., Fairfield, $23,350 ***2.24 mi. S.A. Route 15B, Sect. 20A-WPSO, road from McDonough Co. line east of Bushnell east, Fulton Co., to C. L. Swords, Peoria, $15,555***6.84 mi. road from Roanoke, north and east to Benson, Woodford Co., to Hurden Constr. Co., Springfield, $35,558***0.71 mi. road in Perry Co., to W. Lough & Sons, Marion, $37,593***7.38 mi. Brown Co., to Central West Constr. Co., Maywood, $51,782***3.88 mi. Effingham Co., to Mautz & Oren, Inc., Effingham, $25,826***0.33 mi. Effingham and Fayette Counties, to H. J. Eppel, Pontiac, $39,534*** 0.25 mi. Randolph, St. Clair and Washington Counties, to H. H. Hall Constr. Co., East St. Louis, $45,443***0.73 mi. Jackson Co., to Valley Eng. Co., St. Charles, $29,266. Grand total $503,907. Bids Oct. 21, Nov. 15 and 27, Dec. 6, 13, Jan. 3, 17 and Mar. 3. Noted Jan. 3, Feb. 21 and Feb. 27, E. N.-R.

Indiana — State Hy. Comn., Indianapolis, rein.-con. paving 1.238 mi. Allen Co., to Grace Constr. & Supply Co., Fort Wayne, $56,938 est. $72,067***7.383 mi. Warren Co., to Highland Co., Inc., 644 Baxter St., Louisville, Ky., $158,430 est. $192,527***0.396 mi. Johnson Co., to Union Asphalt Constr. Co., 208 Lemcke Bldg., Indianapolis, $39,609 est. $40,169*** 1.506 mi. St. Joseph and Elkhart Counties, to Reith-Riley Constr. Co., Goshen, $42,063 est. $52,984. Grand total $297,040. Bids M Noted Mar. 6, C. D.—Feb. 20, E. N.-R.

Indiana — State Hy. Comn., Indian crushed stone surfacing 5.881 mi. ro Wells Co., to W. W. Schier, Portland, S est. $35,167***stone surfacing 5.415 mi in Wells Co., and 6.711 mi. road in Bl and Wells Counties, to Meshberger Bros. Grove, $28,529 and $30,307 respectivel $32,968 and $32,811 respectively. Grand $90,112. Bids Dec. 3. Noted Mar. 6, C Feb. 20, E. N.-R.

Kansas—State Hy. Comn., Independen D. H. Hardman, Alton, 10.886 mi. earth culvert and bituminous material surfacin 75-16-WPH 402-A, $40,906; 1.251 mi. P 16-WPH 402-B, $5,981, both Coffey Co. minous material surfacing 7.805 mi. P. WPH 322-F, $21,828; 3.493 mi. P. 54-30 239-F, $9,705; 7.453 mi. P. 54-30 WPH $20,707, all foregoing Greenwood Co.***to & Cone, Ottawa, 3.46 mi. P. 75-11-WPH-4 $8,989; 6.556 mi. P. 75-11-WPH 418-B, 033, both Woodson Co.***to A. G. Sher Constr. Co., Independence, earthwork, c and concrete paving 0.365 mi. P. 166-11-W 285-E, Montgomery Co., $53,278. Grand $178,427. Bids Mar. 20. Noted Mar. 10, —Mar. 12, E. N.-R.

Louisiana—State Hy. Comn., Baton R grading, gravel surfacing 3 mi. Dodson-W Jackson Parish Line Hy., Route 1200, P 895-A, Jackson Parish, to Delony & Ta Dubach, $16,077***concrete paving 0.71 Bogalusa-Pearl Hy., Route 35, Project 6 F.A.P. 49-A, reopened, Washington Parish T. L. James & Co., Ruston, $50,177***gra gravel surfacing 7.27 mi. Quitman-Beech Spr School Hy., Routes 545 and 547, Jackson ish, Project 1134, to Wimberly Constr. Arcadia, $15,916. Grand total $82,170. Mar. 25. Noted Apr. 2, C. D.

Maryland—State Roads Comn., Baltim sheet asphalt paving 0.7 mi. Contr. BC-145 Federal Aid Project NRM 40-C, Baltimore C to P. Flanigan & Sons, Harford Rd. and St., Baltimore, $86,514.

Maryland—State Roads Comn., Baltimore, 1.61 mi. macadam paving along approaches to pro posed W. M. Ry. grade elimination structu Contr. F-262-2-521, Frederick Co., to Thom Bennett & Hunter, Westminster, $70,649; con crete paving 1.15 mi. Contr. S-81-1-12, Som set Co., to Waller Paving Co. Salisbury $36,100 Noted Apr. 2, C. D.—Apr. 9, E. N.-R.

Massachusetts—See "Bridges and Grade Cr ings."

Mass., Auburn—Town, C. Cross, supt. Street Town Hall, repairing bituminous macadam and gravel roads, rebuilding stone culverts and re pair earth dam, damaged by flood, day labor $30,000.

Mass., Bolton—Town, G. A. Rhoades, chn Bd. Selectmen, D. Bonazzoli, supt. Street Town Hall, rebuilding bituminous macadam and gravel hys. damaged by flood, day labor $40,000.

Mass., Dudley — Town, H. G. Alton, supt Streets. Town Hall, rebuilding bituminous mac dam and gravel roads, damaged by flood, day labor. $25,000.

Mass., Fitchburg—City, J. M. Pierce, comr P. Wks., City Hall, rebuilding bituminous mac dam and gravel roads, damaged by flood, day labor. $75,000.

Mass., Harvard—Town, W. E. Haskell, chn Bd. Selectmen, Town Hall, rebuilding bitumi nous macadam and gravel roads, damaged by flood, day labor. $60,000. E. Maynard, supt Streets.

Mass., Leicester—Town, W. J. Belleville, chn Bd. Selectmen, C. J. Rice, supt. Streets, Town Hall, rebuilding bituminous macadam and gravel hys., damaged by flood, day labor. $50,000.

Mass., Leominster—City, H. J. Lawson, supt Streets, City Hall, rebuilding bituminous macadam roads, damaged by flood, day labor $25,000.

Mass., Millbury—Town, P. J. Gibson, chn Bd. Selectmen, H. A. Taylor, supt. Streets, Town Hall, rebuilding bituminous macadam and gravel roads, damaged by flood, day labor $40,000.

Mass., Northbridge — Town, D. C. Duggan chn. Bd. Selectmen, W. Sarty, supt. Streets Town Hall, rebuilding bituminous macadam and gravel roads, damaged by flood, day labor $35,000.

Mass., Spencer—Town, F. D. Cournoyer, chn Bd. Selectmen, A. Jalbert, supt. Streets, Town Hall, rebuilding bituminous macadam and gravel roads, damaged by flood, day labor. $25,000 $30,000.

Mass., Sutton — Town, J. Conley, chn. Bd Selectmen, J. Dudley, supt. Streets, Town Hall rebuilding bituminous macadam and gravel roads, damaged by flood, day labor. $35,000

Mass., Winchester—Town, R. F. Wilkins, chn Bd. Selectmen, Town Hall, bituminous macadam paving Main St., day labor. $26,000.

Minnesota—State Hy. Dpt., St. Paul, improving 9 mi. Project 60-02 A and B, Polk Co. incl. 142,498 cu.yd. excav., to Haagenson & Tranby, McIntosh, $29,228. Bids Mar. 6. Noted Feb. 27, C. D.

†*Federal Government*

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Streets and Roads (Continued)

Missouri—State Hy. Dpt., Jefferson City, concrete paving 0.555 mi. road in Livingston Co., to C. H. Atkinson Paving Co., and Condon, Cunningham & Lemmon, Chillicothe, and Kirkwood, $158,391. Bids Jan. 31. Noted Feb. 6, C. D.

Nebraska — State Dpt. Roads & Irrigation, Lincoln, to Meridian Constr. Co., York, grading 4 mi. Seward Co., $19,011; culverts on same road, $6,564***to B. Steele, Sidney, grading 2.3 mi. Cheyenne Co., $12,526***to C. W. Christ, Sidney, culverts on same road, $4,299; bridge on same road, $7,536; culvert Kimball Co., $1,300***to A. L. Cook, Ottawa, Kan., roadside improvement in Cass Co., $711; Kimball Co., $1,717; Dodge Co., $2,996; Box Butte Co., $2,810***to Central Bridge & Constr. Co., Wahoo, and Allied Bridge & Constr. Co., 703 Union State Bank Bldg., Omaha, viaduct in Douglas Co., $98,678***to E. L. McCain, Blair, bridges in Custer Co., $43,689***to J. R. Tritt, Kimball, roadside improvement, Group 2, Kimball Co., $551; Group 3, same road, $3,017***to Western Asphalt Paving Corp., Sioux City, Ia., grading 6.3 mi. Antelope Co., $25,407***to Morningside Nurseries, Sioux City, Ia., roadside improvement in Washington Co., $2,710; Dodge Co., $2,278; Cherry Co., $2,471***to House of Gurney, Yankton, S. D., roadside improvement, Group 1, Dawes Co., $846***to W. Krotter & Sons, Smart, graveling road in Boyd Co., $1,446; 3 mi. Boyd Co., $1,925***to Nichols Constr. Co., Geneva, culverts in Knox Co., $7,411*** to Yant Constr. Co., 1115 Omaha Natl. Bank Bldg., Omaha, culverts in Wayne Co., $5,870 ***to Phillips & Co., Maywood, grading 3.1 mi. Custer Co., $20,648; 1.2 mi. Frontier Co., $10,984***to Abel Constr. Co., Lincoln, and to W. A. Biba Eng. Co., Geneva, culverts in Custer Co., $6,243***to A. H. Read, Cheyenne, Wyo., 8.9 mi. Kimball Co., $9,953***to Orshek & Christensen, Cedar Rapids, graveling same road, $5,356***to Martin-Day Co., Lincoln, viaduct in Lancaster Co., $49,712***to W. H. Hills, Gresham, grading 6.3 mi. Custer Co., $26,750***to Bushman Constr. Co., St. Joseph, Mo., culverts in Custer Co., $4,867; bridge on same road, $8,413***to Norfolk Bridge & Constr. Co., Norfolk, culverts in Boyd Co., $11,711***to Inland Constr. Co., 3867 Leavenworth St., Omaha, bridge in Boyd Co., $4,409; graveling 3.1 mi. road Keya-Paha Co., $3,488 ***to Weidner & King, Fremont, culverts on same road, $3,888; bridge on same road, $3,558 ***to S. Smith, Gering, culverts in Frontier Co., $2,581***to Weber & Haring, Kearney, bridge on same road, $10,667***to Gerhold & Matzen, Columbus, grading 2.6 mi. Holt Co., $12,253; culverts on same road, $250; graveling same road, $2,045***to House of Gurney, Yankton, S. D., roadside improvement, Dawes Co., $846. Grand total $451,525. Bids Mar. 26. Received no bids Mar. 26, improving roads in Cass, Boyd and Knox Counties; rejected bids Mar. 26, roads in Blaine, Dawes, Knox, Greeley, Nemaha, Wayne and Keya Paha Counties. Noted Mar. 17, C. D.—Mar. 19, E. N.-R.

Nevada — State Hy. Dpt., Carson City, to Utah Constr. Co., Ogden, grading, draining, crushed gravel surfacing 30.07 mi. road in Lincoln Co., $119,541; 29.81 mi. Nye Co., $123,-191; 15.73 mi. Lincoln Co., $94,055. Grand total $346,787. Bids Mar. 27. Noted Mar. 23, C. D.

N. Y., Albany—City, City Hall, grading 1,600 ft. Washington Ave., and grading, widening, ditching Erie Blvd., relief labor, $52,000. **W.P.A.** J. W. Carroll, procurement officer W.P.A., Old Post Office Bldg., Albany, will purchase materials.

N. Y., Albany—Village, concrete paving 15 mi. and gravel sidewalks 5 mi. various streets, relief labor, $98,316. **W.P.A.** J. W. Carroll, Old Post Office Bldg., Albany, procurement officer W.P.A., will purchase materials.

N. Y., Herkimer—Bd. Supervs. Herkimer Co., shouldering, guttering, repairing and gravel and macadam surfacing county highways, by relief labor. Est. about $25,000. **W.P.A.** Owner purchases materials.

N. Y., Herkimer—Herkimer Co., Dpt. Hys., paving 1.96 mi. Willard Rd., $4,000; 2.14 mi. Brockett Rd., $8,500; 2.42 mi. Kingdom Rd., $40,000; 1.77 mi. East St., $30,000; 4.62 mi. Marriott-Burdick Corners Rd., $58,000; 1.51 mi. Cramers-Ostranders-Corners Rd., $24,000; 2.89 mi. Paradise Indian Castle Rd., $50,000; 3 mi. South Shore Rd., $15,000, by day labor. Total $334,500. In addition to above owner approved expenditure of $115,000 for maintenance of present paved highways.

N. Y., Johnstown—Bd. Supervs. Fulton Co., shouldering, guttering, repairing and surfacing county highways, relief labor. Est. about $25,-000. **W.P.A.**

N. Y., Lloyd—Village, repairing, guttering and paving various streets by relief labor, $30,-000. **W.P.A.** J. W. Carroll, Old Post Office Bldg., Albany, procurement officer W.P.A., will purchase materials.

N. Y., Marshall—Town, regrading, guttering, repairing 2.28 mi. Maxwell Rand Rd. from MacConnels Corners to Paris town line, relief labor, $26,000. **W.P.A.** D. Mahoney, Hotel St., Utica, procurement officer W.P.A., will purchase materials.

N. Y., New Rochelle—Village, eliminating excessive crowns and deep gutters on 8 city streets, by relief labor, $129,800. **W.P.A.** J. E. Carroll, High School, Main St., White Plains, procurement officer W.P.A., will purchase materials.

N. Y., Peekskill—Village, removing trolley rails, constructing drainage structures and repaving Main St., relief labor, $26,000. **W.P.A.** D. Jordon, High School, Main St., White Plains, procurement officer W.P.A., will purchase materials.

N. Y., Rome—City, City Hall, landscaping, ditching, macadam repaving 295 mi. streets, incl. 20 culverts and reflooring 5 bridges, relief labor, $44,514. **W.P.A.** D. Mahoney, Hotel St., Utica, procurement officer, W.P.A., will purchase materials. J. Gawkins, city engr.

N. Y., Saugerties—Village, widening, ditching, shouldering, installing concrete culverts on 2 mi. road from Manorville to Saxton-Blue Mountain Rd., relief labor, $25,000. J. W. Carroll, Old Post Office Bldg., procurement officer W.P.A., will purchase materials.

N. Y., Syracuse—Onondaga Co., Court House, bituminous and gravel resurfacing and repairing county highways, by day labor, $200,000. Owner will purchase 200,000 gal. bituminous material and large tonnage gravel. Will be financed from county's share of motor vehicle fees.

N. Y., White Plains—City, constructing 122,-329 lin.ft. sidewalk, 68,100 lin.ft. curbing, 51,-000 lin.ft. gutters, on 57 city streets, by relief labor, $392,684. **W.P.A.** D. Jordan, High School, Main St., White Plains, procurement officer W.P.A., will purchase materials.

N. Y., Yonkers—City, City Hall, widening and paving Ashburton Ave., to W. Hopper, 29 Williams St., Est. $59,977. **P.W.A.** C. Sheridan, city engr.

North Carolina—State Hy. Comn., Raleigh, grading, artificial sand clay surfacing 15.36 mi. Project 2749, Sampson, Johnston and Harnett Counties, to West Constr. Co. of North Carolina, Kinston, $79,933***structures on same road, to T. A. Loving Co., Goldsboro, $15,792. Bids Mar. 17, awarded Mar. 31. Noted Mar. 23, C. D.

★ **North Carolina**—State Hy. Comn., Raleigh, (**P. means Project**), to F. J. McGuire, Washington, concrete paving 0.87 mi. P. 1084, Bertie Co., $21,690***to F. D. Cline, Raleigh, 0.79 mi. P. 1481, Hertford Co., $10,465***to R. E. Fuller, Raleigh, 0.63 mi. P. 1646, Nash Co., $14,820***to Atlantic Bitulithic Co., Winston-Salem, 1.01 mi. P. 1653, $34,074 and 0.71 mi. P. 1654, $20,206, both Northampton Co.***to West Constr. Co. of N. C., Kinston, grading, sand asphalt surfacing, structures 4.83 mi. P. 2110, Craven Co., $80,580***to J. M. Gregory, Raleigh, bituminous surface treating 7.77 mi. P. 4306, Granville Co., $10,499; 6.94 mi. P. 4685, Person and Granville Counties, $36,009***to Hardaway Contg. Co., Georgia Home Bldg., Columbus, Ga., bituminous surface treating 5.68 mi. P. 7812, Wilkes Co., $22,317***to E. W. Grannis, Fayetteville, grading, bituminous surfacing 14.76 mi. P. 8472, McDowell Co., $199,728***to Hobbs-Peabody Constr. Co., 317 West Worthington Ave., Charlotte, structures 14.76 mi. P. 8472, McDowell Co., $36,553***to J. M. Porter, Charlotte, approaches and overhead crossing 0.11 mi. P. 529, $11,496; 0.14 mi. P. 530, $10,477, both in Cleveland Co.***to Kiker & Yount, Reidsville, bituminous surface treating 11.65 mi. P. 4611, Iredell and Wilkes Counties, $53,145; 6.98 mi. P. 6292, $26,365; 5.98 mi. P. 6284, $23,301, both in Catawba Co.; structures on 3.85 mi. P. 3813, Pender Co., $7,315 ***to C. G. Fuller, Barnwell, S. C., grading, sand bituminous road mix surfacing 3.85 mi. same road, $43,957***to T. A. Loving & Co., Goldsboro, approaches and underpass 0.36 mi. P. 1396, Halifax Co., $28,152***to Wilson Constr. Co., Asheville, grading, artificial sand clay surfacing 6.38 mi. P. 527, Rutherford Co., $44,656***to L. Riddle Co., Asheville, structures on same road, $12,625***to Cobb & Homewood, Chapel Hill, approaches and overhead crossing 0.43 mi. P. 6090, Anson Co., roadway $21,684; structures on same road, $36,901. Grand total $837,015. Bids Mar. 26, awarded Mar. 26. Noted Mar. 23, C. D.

Oklahoma—State Hy. Dpt., Oklahoma City, grading, draining 4.76 mi. roads in Johnston Co., and 4.87 mi. Okmulgee Co., to S. O. Maxey, Durant, $33,695 and $38,248 respectively, est. $33,961 and $38,887 respectively***concrete paving 4.85 mi. Nowata Co., and 3.26 mi. Rogers Co., to Moran & Bruckner, Muskogee, $114,713 and $92,241 respectively, est. $141,-000 and $95,000 respectively***3.51 mi. Major Co., to J. W. Moorman, Hominy, $17,009 est. $20,000***5.24 mi. Creek Co., to Gaines Bros., Miami, $28,710 est. $30,000***5.67 mi. Garvin Co., to Merveldt & Lawson, El Reno, $30,-286 est. $30,376. Grand total $354,903. Bids Mar. 24. Noted Mar. 31, C. D.

★ **Pennsylvania**—Dpt. Hys., Harrisburg, bituminous on native stone surfacing 0.23 mi. Route 02023, Altoona City, Blair Co., to Blair Constr. Co., Hollidaysburg, $8,873***1.28 mi. Sect. 2, Route 869, Rush Twp., Center Co., to L. Stein, Phillipsburg, $20,938***1.19 mi. Route 14028, Sect. 3, Marion Twp., Center Co., to J. L. Wilson, State College, $15,889***0.23 mi. Route 197, Sect. 4, Frederick Twp., Montgomery Co., to J. J. Skelly Co., Inc., Media, $21,205***rein.-con. paving 4.72 mi. Route 200, Sect. 3, Athens and Bloomfield Twps., Crawford Co., to Baldwin Bros. Paving Co., Union Trust Bldg., Cleveland, O., $197,399***rein.-con. paving 0.89 mi. and constructing rein.-con.

†*Federal Government.*

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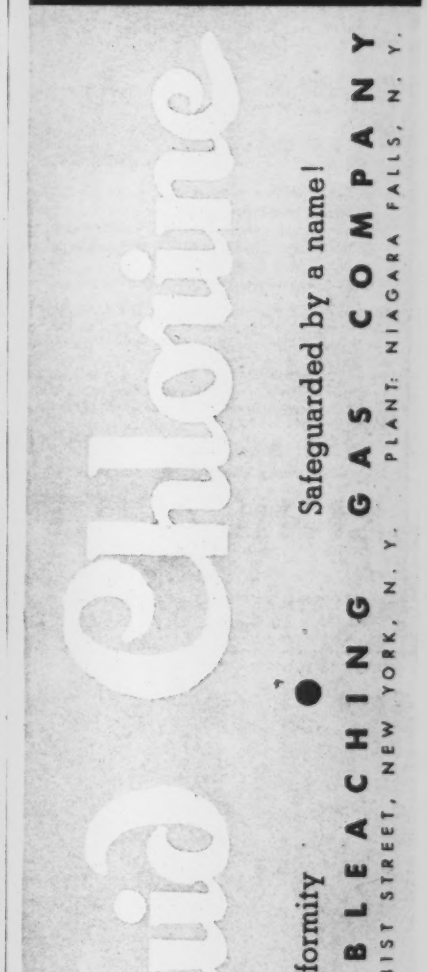
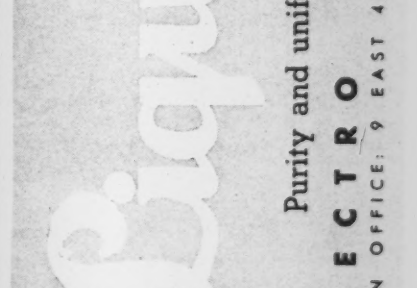
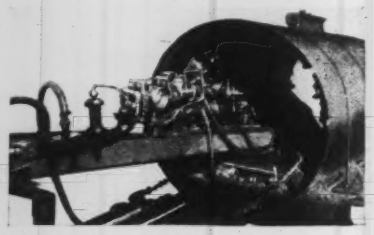

electro chlorine
Safeguarded by a name!
Purity and uniformity
ELECTRO BLEACHING GAS COMPANY
MAIN OFFICE: 9 EAST 41ST STREET, NEW YORK, N. Y. PLANT: NIAGARA FALLS, N. Y.



BUILD SEWERS IN TUNNEL



- Save paving replacement.
- Save traffic inconvenience.
- Save underground structure replacement.
- Build concrete lining blocks at home with local labor and local materials.
- Construct sewer in tunnel with local labor.

Skilled shield operator furnished by Link-Belt Company. As economical as open cut construction at depth of 12 ft. Complete tunnel shield and block making equipment rented by Link-Belt Company at fixed price per foot of tunnel constructed. See descriptive article in Engineering News-Record, December 12, 1935, or write for reprint.

LINK-BELT COMPANY
2045 W. Hunting Park Avenue Philadelphia

LINK-BELT T&M TUNNEL SHIELD 5610

SWIFT acceleration at full power — quick and accurate stops blended to form a smooth high speed swing — walking traction that saves time moving — these are some of the reasons for the Bucyrus-Monighan's high yardage output. Manufactured by Bucyrus-Monighan Company, Chicago, Ill.

BUCYRUS-ERIE
EXCAVATING, DRILLING, AND MATERIAL HANDLING EQUIPMENT, SO. MILWAUKEE, WIS.

Streets and Roads (Continued)

bridge, Route 276, Sect. 5B-1, Portage and Washington Twps., Cambria Co., to S. T. Brotemarkle Constr. Co., 3116 Brownsville Rd., Pittsburgh, $93,601***constructing 0.11 mi. plate girder overpass bridge and rein.-con. and bituminous on crushed stone paving the lanes, Route 180, Sect. 5, Ridley Park Borough, Delaware Co., to Kaufman Constr. Co., 1505 Race St., Phila., $108,742***constructing 0.39 mi. encased I-beam overpass bridge with clear 30 ft. span, and bituminous on crushed stone surfacing Route 23022, Middleton Twp., Delaware Co., to Girard Constr. Co., 6528 Girard Ave., Phila., $30,800***rein.-con. paving 0.29 mi. and extending existing rein.-con. bridge, Route 3-1-A, Cooper and Montour Twps., Montour and Columbia Co., to R. Rosser, 55 South Washington St., Wilkes-Barre, $13,720. Grand total $511,167. Bids Mar. 6. Noted Nov. 12, C. D.—Mar. 19, E. N.-R.

Pennsylvania—Dpt. Hys., Harrisburg, grading, drainage 5.88 mi. Route 22026, Middle Paxton and Rush Twps., Dauphin Co., to Hempt Bros., Camp Hill, $72,971***bituminous on native stone surfacing 1.76 mi. Route 678, Sect. 2, Franklin Twp., Allegheny Co., to D. W. Challis & Sons, Sewickley, $84,446***0.4 mi. Route 07041, Sect. 1, Antis Twp., Blair Co., to Blair Constr. Co., Hollidaysburg, $7,836***1.12 mi. Route 26, Sect. 1, Franklin Twp., Snyder Co., to Poffer & Viall, Hummelstown, $27,760*** bituminous on native stone surfacing 0.22 mi. and constructing timber deck I-beam bridge, Route 90, Sect. 2, Plum Twp., Venango Co., to C. H. Fry Constr. Co., 1902 Cherry St., Erie, $15,788. Grand total $208,801. Bids Mar. 13. Noted Mar. 19, C. D.—Mar. 26, E. N.-R.

Texas—G. Gilchrist, state hy. engr., Austin, concrete paving 2.471 mi. Hy. 31, F.A.P. 124, Unit 2, Hill Co., to Froemming Bros., Inc., Montopolis Bridge, Austin, $63,441. Est. $70,000. Bids Mar. 10. Noted Mar. 16, C. D.

Utah—State Road Comn., Salt Lake City, rock asphalt roadbed surfacing 9.263 mi. state highway between Ft. Duchesne and Half Way Hollow, Uintah Co., to Northwestern Eng. Co., Rapid City, S. D., $28,822***grading, draining, plant mix asphaltic roadway surfacing 8.835 mi. state highway between Duchesne and Fruitland, Duchesne Co., incl. 72,000 cu. yd. unclassified excav., to Reynolds-Ely Constr. Co., Springville, $105,381***draining, hy. subgrade 3.006 mi. state highway between Salt Lake and Murray, Salt Lake Co., to Ryberg Bros., Interurban Depot Bldg., Salt Lake City, $38,619. Grand total, $172,822. Noted Mar. 19, C. D.

Utah—State Road Comn., grading, draining, roadbed gravel surfacing 5.301 mi. state highway between Horse Shoe Bend & Loa, Sevier Co., incl. 73,000 cu.yd. unclassified excav., and 2.474 mi. state highway between Wanship and Peca, Summit Co., 27,000 cu.yd. unclassified excav., to L. A. Young Co., Richfield, $71,986 and $25,842 respectively, est. $76,590 and $25,760 respectively. Noted Mar. 19, C. D.

Wash., Goldendale—Klickitat Co., grading, surfacing, moving 150 ft. steel span bridge 2.597 mi. Goldendale-Glenwood Hy., to G. J. Norris, Spokane Hotel, Spokane, $31,526. Noted Mar. 6, C. D.—Mar. 12, E. N.-R.

Wash., Seattle—Bd. P. Wks., grading 54th St. from Wabash to Rainier Sts., to Acme Constr. Co., 428 McGilvra Blvd., $35,778. Est. $41,077. Noted Mar. 27, C. D.—Apr. 2, E. N.-R.

Wash., Seattle—Bd. P. Wks., grading, paving Rainier Ave. from 57th St. to city limits, to Fiorito Bros., 1100 Leary Way, $123,575. Est. $173,000. Noted Mar. 18, C. D.—Mar. 26, E. N.-R.

★ **Wisconsin**—State Hy. Comn., Madison, to Schuster Constr. Co., Denmark, grading, draining, gravel surfacing 3.798 mi. Brown Co., $65,961; 1.321 mi. city streets, Oconto Falls, U. S. Wks. Project WPMS 711, Sects. 1, 2 and 6, $10,400; 0.765 mi. village streets, Gillett, U. S. Wks. Project WPMS 710, Sects. 1 and 3, $8,808, both Oconto Co.***to Cherney Constr. Co., Francis Creek, 1.063 mi. city street, U. S. Wks. Project WPMS 709, Sects. 1 and 2, Oconto Co., $11,331***to Madison Paving Co., 515 West Johnson St., Madison, grading, draining, concrete surfacing 0.246 mi. Dodge Co., $12,224***to Jaeger Bros., Inc., top soil base course gravel surfacing 5.094 mi. Marquette Co., $27,053***to P. W. Ryan Sons, 303 South 3rd St., Janesville, crushed stone surfacing 6.777 mi. Green Co., $5,448***to O. Sanders, Mt. Horeb, 1.136 mi. Vernon Co., $6,976***to Miller & Sollnow, Monroe, grading, draining, crushed stone surfacing 0.293 mi. Elm St., city of Lancaster, Grant Co., $5,202***to A. B. Lynch Co., 2221 South Newton Ave., Milwaukee, grading, draining 0.906 mi. Sauk Co., $17,940*** to F. C. Raemisch, Waunakee, 6.178 mi. Jefferson Co., $34,998***to Ryan Bros., DePere, 5.094 mi. Marquette Co., $60,407***to J. Udelhofen, Potosi, 1.136 mi. Vernon Co., $117,344 ***to V. Nelson, 2201 Hughitt Ave., Superior, 2.381 mi. Douglas Co., $74,443***to Kramp Constr. Co., 803 East Wisconsin Ave., Milwaukee, constructing nine substructure units and one 8 ft. slab span culvert Boscobel Bridge, State Project 9451, Grant and Crawford Counties, $96,955. Grand total $555,490. Noted Apr. 1, C. D.—Apr. 9, E. N.-R.

Wyoming — See "Bridges and Grade Crossings."

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EARTHWORK, IRRIGATION DRAINAGE AND WATERWAYS

PROPOSED WORK

†**Mass., Nantucket**—U. S. Eng., Providence, R. I., taking bids dredging 92,000 cu.yd. material in entrance channel at Nantucket Harbor. Noted July 1, C. D.—July 4, E. N.-R.

★ †**Mont., Fort Peck**—U. S. Eng. Fort Peck, soon takes bids emergency gate shaft, electrical equipment, motors, buildings, plate, hates, for Fort Peck Tunnels. $1,000,000.

N. J., Ocean City—City Comn. voted emergency action and authorized $20,000 for 4 jetties from 200 to 400 ft. deep along beach from 2nd to 10th Sts. W. H. Collison, City, engr.

★ †**New York and Pennsylvania**—U. S. Eng. Wash., D. C., made plans flood control program, incl. detention reservoirs and related flood control works for protection of Binghamton, Hornell, Corning and other towns in New York and Pennsylvania $33,084,000; constructing levees in Susquehanna River Basin at Harrisburg, Pa., 104,000; levees on north branch of Susquehanna River, Bloomburg, Pa., $131,000; levees on north branch of Susquehanna River at West Pittsburgh, Pa., $100,000; levees at Sunbury, Pa., $93,600. Approved by Bd. Engineers for Rivers & Harbors. G. E. Markham, c/o U. S. Engineers, Wash., D. C., in complete charge of work.

★ †**N. Y., Binghamton**—City, C. A. Harrell, mgr. City Hall, plans constructing rein.-con. dikes on both sides Susquehanna and Chenango Rivers, work starts at once on dike at end of McDonald Ave., 1st Ward, using $165,000 emergency fund granted by W.P.A. Making plans 600 ft. dike at Front St., damaged in recent floods. Total $2,000,000. W.P.A. project. J. A. Giles, city owner, engr.

★ †**N. Y., Mount Morris**—Rochester Gas & Electric Co., East Ave., Rochester, plans 14 mi. rein.-con. dam, 180 ft. high, to impound 20 billions cu. ft. water for power development, $13,000,000. **Maturity in 1936.** Private plans.

O., East Liverpool—City plans 2,300 ft. rip-rap wall along north shore Ohio River part flood control project, incl. 10,000 cu.yd. fill. Applied for $43,784 W.P.A. allocation. Est. $47,459. City will purchase materials $3,675.

Oregon—See "Unclassified."

★ †**Pa., Tyrone**—Boro, Boro Hall, plans rehabilitation of flood damaged properties, dredging Little Juniata River, constructing retaining walls and dikes, $569,785; replacing bridges, $118,250; straightening channel Dry Run and constructing retaining walls, $551,280; channeling Bald Eagle Creek and constructing retaining walls from 12th to 14th Sts., $176,000; filling in streets and alleys $45,302; resurfacing damaged streets, $78,412. Total est. $1,539,000. Will apply for Federal funds to help finance projects. M. Hagerman, burgess.

Tex., Corpus Christi—Nueces Co. Navigation & Water Dist., City of Corpus Christi, C. S. Clark, dist. Bd., Chn., c/o J. A. Mobley, comptro and con for project now being argued before State Bd. of Water Engineers, etc., for diverting water of Guadalupe River for use at Corpus Christi and other towns enroute. Engineers would divert 38,000 acre-ft. water annually or 50 cu.ft. per second, near Victoria, $300,000. Terrell Bartlett Engineers, Milam Bldg., San Antonio, engrs.

★ †**Utah, Provo**—Bureau Reclamation, Denver, Colo., preliminary plans constructing Deer Creek Reservoir project. Project will begin when 80% of the stored water is subscribed, $7,900,000. R. F. Walter, Denver, Colo., chf. engr.

N. S., Yarmouth—Municipality plans dredging in Yarmouth Harbor, $143,000 federal appropriation granted.

BIDS ASKED

†**Calif., San Francisco**—Apr. 30, by U. S. Eng., Custom House, furnishing, placing 61,000 tons Class A, 50,800 tons Class B and 90,000 tons Class C rock, Schedule A; 61,000 tons Class A, 58,000 tons Class B and 90,000 tons Class C rock, Schedule B; constructing 16,000 ft. rubble retaining wall enclosing upper levels of fill to be made on shoal on San Francisco Bay north of Yerba Buena Island.

†**Ga., Savannah**—May 1, by U. S. Eng., Savannah, repairing 570 lin. ft. existing steel sheet pile training wall and rebuilding 300 lin. ft. wall which has failed, in Savannah Harbor.

†**Louisiana**—Apr. 30, by U. S. Eng., Vicksburg, Miss., constructing 17,000 cu.yd. levee work and 5,950 lin.ft. levee work, false berm and fill, for east bank Ouachita River.

†**Louisiana**—Apr. 30, by U. S. Eng., P. O. Box 667, Vicksburg Miss., restoring, repairing, discing, dressing and sodding 1,878 stations of levee on right and left banks for Ouachita River, here.

†**Montana** — Apr. 27, by Bureau Reclamation, Missoula, constructing structures and canal lining for main canal, and earthwork and structures for laterals and O'Keefe Wasteway, Frenchtown Project, near here, incl. 152,000 cu.yd. excav for canal, laterals and wasteway, Spec. 679.

Neb., Hastings — Apr. 15, by Central Nebraska Public Power & Irrigation Dist., 3rd

†*Federal Government.*

Earthwork, etc. (Continued)
St. and St. Joseph Ave., 28,500 cu.yd. stripping, 25 acres clearing, 25 acres grubbing, 57,000 cu.yd. trench excav., 19 acres scoring, soil testing shaft, additional soil testing shafts, for Keystone Reservoir Dam, Jeffrey Canyon and Johnson Canyon Reservoir near Ogallala and Gothenburg, P.W.A. project. G. E. Johnson, ch. engr. and genl. mgr.

Tex., Palacios—Apr. 18, by Seawall Comn., G. H. Harrison, chn., constructing seawall, storm sewers, etc. $17,000. Southwest Engrg. Co., Littlefield Bldg., Austin, engrs. **P.W.A.** project.

†Tex., Port Aransas—Apr. 24, by U. S. Eng., Galveston, installing three 36 in. diam. fishway culverts thru south jetty, Port Aransas.

Ont., Harriston—Apr. 20, by J. H. Shannon, clk. Minto Twp., dredging 2 mi. Coon Creek Drain, involving 28,000 cu.yd. excav.

LOW BIDDERS

★**†New Mexico**—Bureau Reclamation, El Paso, Tex., Apr. 3, constructing Caballo Dam on Rio Grande River, from Mittry Bros. Constr. Co., 5531 Downey Blvd., Los Angeles, Calif., $975,260. Est. $1,000,000. Noted Mar. 12, C. D.—Mar. 19, E. N.-R.

CONTRACTS AWARDED

★**Ia., Council Bluffs**—City Council, flood control within city, on Indian Creek, being Indian Creek Flood Control Project, Sect. 5, to E. A. Wickham Co., Council Bluffs, $365,000; same project, Sect. 1, to Union Constr. Co., 1110 Locust St., Des Moines, $214,700. **P.W.A.** Bids Mar. 24 and 25. Noted Mar. 17, C. D.—Mar. 19, E. N.-R.

N. J., Ocean City—City Comn., repairing bulkheads along Bay Ave. from 1st to 2nd Sts., to Monihan Contg. Co., Ocean City, $5,882. Awarded Apr. 1. Noted Mar. 11, C.D.—Mar. 19, E.N.-R.

†Va., Norfolk—Yards & Docks, Navy Dpt., Wash., D. C., dredging at Naval Operating Base, Spec. 8085, to Norfolk Dredging Co., P. O. Box 486, 39.9c. per cu.yd. scow measurement, total $104,000.

FEDERAL POWER COMMISSION

Application for Licenses and Permits
Licenses

1359—California Utilities Co., San Francisco, wants license constructed transmission line in Lassen County, affecting lands in Lassen Natl. Forest.

1360—San Joaquin Light & Power Corp., Fresno, wants license transmission lines in Madera Co. affecting lands in Sierra Natl. Forest.

1361—Pacific Gas & Electric Co., 445 Sutter St., San Francisco, wants license constructing transmission line in Placer Co. affecting public lands.

1362—William Gray Meharg, Anniston, Ala., wants preliminary permit constructing power project on Coosa River at U. S. Lock and Dam 2, Calhoun Co., Ala.

1363—Arizona Power Corp., Prescott, wants license constructing transmission lines in Yavapai and Coconino Counties, Coconino Natl. Forest.

1364—Southern California Edison Co., Ltd., 601 West 55th St., wants license constructing transmission lines in Fresco County, affecting lands in Sierra Natl. Forest.

1365—Mountain States Power Co., Albany, Ore., wants license constructing transmission line in Lane Co.

UNCLASSIFIED

PROPOSED WORK

★**Calif., Los Angeles**—FIRE ALARM SYSTEMS, etc.—City, plans expending $593,000 for fire alarm systems and teletypes, fire alarm equipment includes $234,000 for Metropolitan area, $60,000 for San Fernando Valley, $75,000 for Venice Dist., and $122,000 for San Pedro-Wilmington Dist.; police equipment and teletypes includes $35,000 for Metropolitan area, $60,000 for San Fernando Valley, $5,000 for San Pedro-Wilmington area and $2,000 for Venice Dist.

Ill., Johnson City—COAL MINE—State Dpt. Mines & Minerals, Springfield, projected an engineering survey of the flood Old Ben coal mine, the survey is preliminary to purchasing and installing pumping equipment to drain mine. $100,000 appropriation authorized.

Kan., Hays—SWIMMING POOL, etc.—City plans native stone swimming pool and bathhouse, $51,000. Election Apr. 7, bonds for same. E. T. Archer & Co., 609 New England Bldg., Kansas City, Mo., engrs. Noted Sept. 5, C. D.—Sept. 12, E. N.-R.

La., Crowley—GAS PIPE LINE—United Gas Public Service Co., Rusk Bldg., Houston, Tex., seeks permission of War Department for laying 4 in. gas pipe line on bottom of, under and across Bayou Plaquemine Brule 3 mi. west of here.

Miss., Columbus—POWER SURVEY—City appointed A. H. Beard Eng. Co., engrs., 2606 Oak View Terrace, Maplewood (St. Louis P. O.), Mo., to make power survey of Columbus. Attempt will then be made to secure T.V.A. power. (**Correction**—Engineers' address.) Noted Mar. 26, C. D.—Apr. 2, E. N.-R.

N. Y., Brooklyn—PLAYGROUND—Bd. Educ., 500 Park Ave., New York, plans by W. C. Martin, Flatbush Ave. extension and Concord St., Brooklyn, altering playground, Whitney Ave. and Knapp St. $34,000.

N. Y., Herkimer—FIRE ALARM SYSTEM—Bd. Village Trustees plans installing fire alarm system, incl. 6 circuit rectifiers, panel board, repeater, 80 cell storage battery to handle 120 boxes. To exceed $23,000.

O., Massillon—SWIMMING POOL—City retained Albrecht & Wilhelm, archts., Massillon, to draft plans for 82½x35 ft. outdoor swimming pool with separate wading pool for children, at Brookside County Club, near here. Est. about $25,000.

O., Troy—GRANDSTAND—City plans approved grandstand, 2,400 seating capacity, for municipal athletic field on North Market St. $31,000. City to furnish all materials. E. H. Bagford, city engr.

Okla., Oklahoma City—OIL PIPE LINE—Empire Pipe Line Co., Bartlesville, plans constructing 11,000 ft. 6 in. pipe line in 30th St. $22,000. E. D. Hill, Insurance Bldg., Oklahoma City, engr.

Okla., Oklahoma City—GAS LINE—Phillips Petroleum Co., Bartlesville, made plans constructing 9,000 lin.ft. 20 in. wet gas line pipe on Lindsay St. $35,000. A. H. Riney, Bartlesville, engr.

Okla., Oklahoma City—OIL PIPE LINE, etc.—Phillips Petroleum Co., Bartlesville, made plans 6 in. oil line and 10 in. gas line on Lindsay and 28th Sts. $40,000. A. H. Riney, Bartlesville, engr.

Okla., Oklahoma City—OIL PIPE LINE—Stanolind Pipe Line Co., Tulsa, made plans constructing 10,600 lin.ft. 8 in. pipe line on 33rd St. $28,000. H. W. Gibbs, Tulsa, engr.

★**Oregon**—RAILROAD—Gold Coast R.R. Port Orford, authorized by Interstate Commerce Comn. to build 90 mi. railroad from Leland to Port Orford (route of railroad up Roque River Canyon), and rebuilding Port Orford jetty destroyed by winter's storm. $4,150,000. Noted Aug. 6, E. N.-R.

Ore., Salem—RAILROAD—Oregon Pacific & Eastern R.R., G. F. Gerlinger, pres., genl. mgr. and treas., Portland, authorized to construct 6.5 mi. line Lane Co. from Walden to proposed mill and townsite near Mosby, $23,352.

Pa., Hollidaysburg—GAS LINES—Peoples Natural Gas Co., Box 1756, Pittsburgh, plans replacement and repairs to gas lines, distributing systems, etc., damaged by flood throughout Blair Co. $50,000. **Maturity at once.** L. Tonkin, Box 1756, Pittsburgh, ch. engr.

Tex., McAllen—NATURAL GAS DISTRIBUTING SYSTEM, etc.—Hidalgo Gas Co., McAllen, granted franchise to construct natural gas main line from Samfordyce Field, near Mission to city limits of McAllen, probably use 8 in. e.l. welded pipe for main line. May use own forces, purchase pipe. Private plans.

Tex., Mission—NATURAL GAS DISTRIBUTING SYSTEM—Hidalgo Gas Co., McAllen, making surveys laying 8 in. natural gas main line from Samfordyce fields to city limits. Arranging franchise for system between city and owners. Private plans.

Utah, Salt Lake City—TRANMISSION LINE—Utah Power & Light Co., Scarns Bldg., plans 25 mi. high voltage transmission line from company's new steam power plant now being built in Provo Canyon to Park City. $60,000. J. A. Hale, Salt Lake City, engr.

BIDS ASKED

Ind., Indianapolis—RAILROAD—See "Materials and Equipment."

New York, Massachusetts and Pennsylvania—RAILROAD—See "Contracts Awarded."

N. Y., Rochester—AIRPORT—See "Contracts Awarded."

N. Y., Rochester—PARK—See "Contracts Awarded."

N. Y., Syracuse—AIRPORT—See "Contracts Awarded."

N. Y., Tarrytown—POLICE RADIO SYSTEM—Apr. 22, by Town Bd. in town of Greenburgh, Lyceum Bldg., Bway. and Central Ave., Tarrytown, furnishing, installing 2-way ultra high frequency police radio communication system for town of Greenburgh and outside incorporated villages. N. C. Templeton, clk.

N. Y., Troy—AIRPORT—See "Contracts Awarded."

N. Y., Utica—PARKS—See "Contracts Awarded."

O., Cleveland—MALL—Apr. 17, by City, improving mall, consisting of concrete sidewalks, marble curbing, curb slot, inlet basins, control valve and expansion strips, $20,000. J. Fratoe, City Hall, engr. Noted Mar. 11, C. D.—Mar. 19, E. N.-R.

Ore., The Dalles—OIL DOCK—City takes bids immediately 100 ft. fireproof steel, concrete oil dock with foundations for additional 100 ft. when needed. $35,000. B. C. Allin, consult. engr.

Pennsylvania, West Virginia, etc.—TELEGRAPH LINE REPAIRS—See "Contracts Awarded."

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†Federal Government.

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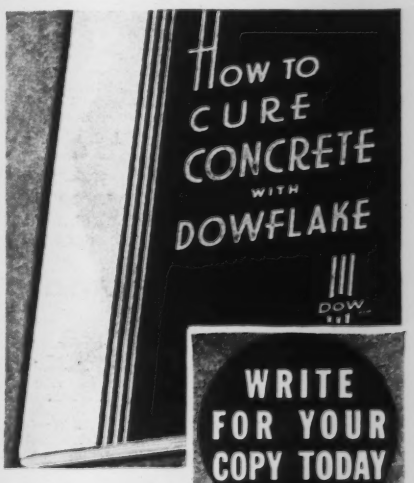

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Unclassified (Continued)

Texas—OIL PROPERTY DEVELOPMENT—See "Contracts Awarded."

★ **†T. H., Hickam Field**—HANGARS—Apr. 28, by Con. Q. M., constructing 4 air corps double hangars, H type, incl. utilities. $1,600,000. Noted Feb. 24, C. D.—Feb. 27, E. N.-R. under "Public Buildings."

CONTRACTS AWARDED

★ **New York, Massachusetts and Pennsylvania**—RAILWAY REPAIR—New York Central R. R. Co., J. W. Plan, ch. engr., 466 Lexington Ave., New York, N. Y., repairing flood damage to railway (incl. damage to Boston & Albany R.R. $200,000-$250,000), day labor and separate contracts. $750,000.

N. Y., Rochester—AIRPORT—City, City Hall, improving municipal airport to include hangars, runways, lighting, drainage, etc., relief labor, $228,375. **W.P.A.** A. Hackett, 1460 South Ave., Rochester, procurement officer W.P.A., will purchase materials.

N. Y., Rochester—PARK—Bd. Supervs. Monroe Co., County Bldg., improving Powder Mill Park, incl. drainage, landscaping, constructing artificial lake, concrete dam, flooding 30 acres by relief labor, $56,694. **W.P.A.** A. Hackett, 1460 South Ave., procurement officer W.P.A., will purchase materials.

N. Y., Syracuse—AIRPORT—City, R. D. Marvin, mayor, City Hall, constructing additional airport facilities, incl. clearing, grubbing, excavation, grading, drainage system, constructing runways, relief labor, $40,316. **W.P.A.** G. L. Noble, Old Post Office Bldg., procurement officer W.P.A., will purchase materials.

N. Y., Troy — AIRPORT — City, City Hall, clearing, grading, grubbing land near airport for enlarging airport, relief labor, $59,568. **W.P.A.** J. W. Carroll, Old Post Office Bldg., Albany, procurement officer, W.P.A., will purchase materials.

★ **N. Y., Utica** — PARKS — Common Council constructing park improvements, by relief labor, $1,260,000, of which $900,000 is for labor, $300,000 for materials and $60,000 for equipment. **W.P.A.** Bd. Contr. & Supply will purchase tools and equipment at once without competitive bidding. D. Mahoney, Hotel St., Utica, Procurement Officer, W.P.A., will purchase other materials. Noted Mar. 20, C. D.—Mar. 26, E. N.-R.

Okla., Ada — PIPE LINE — Stanolind Pipe Line Co., Tulsa, constructing 31 mi. 8 in. oil pipe line, to O. C. Whittaker, Ada, $75,000. Est. $100,000. Awarded Mar. 25. H. W. Gibbs, Tulsa, engr.

Pennsylvania, West Virginia, etc.—TELEGRAPH REPAIRS and REPLACEMENTS—Postal Telegraph & Cable Corp., 67 Broad St., New York, making repairs and replacements due to floods, day labor. Est. about $75,000.

Pennsylvania, West Virginia, etc. — TELEGRAPH LINE REPAIRS—Western Union Telegraph Co., 60 Hudson St., New York, repairing telegraph lines due to flood damage, Pennsylvania, West Virginia, etc., day labor, $200,000.

R. I., Cranston—STADIUM—Central Eng. & Constr. Co., 210 Main St., Pawtucket, plumbing for 51x305 ft. bleachers at Athletic Field, to Thomas R. Douglas, 8 Slocum St., Providence, for City, Bd. Contracts & Purchase, City Hall. Noted Feb. 21, C. D.—Feb. 27, E. N.-R., under "Contracts Awarded."

Texas—OIL PROPERTY DEVELOPMENT—Coastland Oil Corp., c/o J. Meyer, Jr., and Co., 120 Bway., New York, developing oil properties various locations, day labor. To exceed $100,000.

MATERIALS AND EQUIPMENT

PROPOSED WORK

VIBRATING SCREEN—**Los Angeles, Calif.**—A. J. Holm, city purch. agt., City Hall, rejected bids Mar. 10, one 48 in. x 12 ft. double deck Symons Bros. or equal horizontal vibrating screen for city asphalt plant, Spec. 3481. Noted Mar. 18, C.D.

TOOLS, ROAD MACHINERY, etc.—**Hartford, Conn.**—City, C. Yale, secy. Bd. Contr. & Supply, plans replacing tools, road machinery and street equipment damaged by flood. Est. $70,000.

FIRE DEPARTMENT APPARATUS — **Duxbury, Mass.**—Town, S. C. Soule, chn. Bd. Selectmen, Town Hall, soon purchases apparatus for Fire Dpt. $3,000.

ASPHALT, etc.—**Wellesley, Mass.**—Town, J. T. Ryan, clk., Town Hall, plans purchasing asphalt, oil and tar products for hy. construction, $13,500 funds appropriated.

FIRE APPARATUS—**Wellesley, Mass.**—Town, J. T. Ryan, clk., Town Hall, plans purchasing fire apparatus, $9,500 fund appropriated.

SNOW PLOW—**Belle Plaines, Minn.**—Blakeley Twp., E. Kerkow, twp. clk., plans purchasing 1 snow plow, motor operated.

MOTOR PATROL — **Gaylord, Minn.** — Sibley Co. rejected bids Mar. 10, furnishing 1 motor patrol. Noted Jan. 23, C. D.—Jan. 30, E. N.-R.

FIRE TRUCK—**Jordan, Minn.**—St. Lawrence Twp., plans purchasing fire truck. J. M. Schwingler, twp. clk.

STEEL TANKS—**St. Louis, Mo.**—A. R. Miller, 3445 Hampton Ave., applied to Ed. Public Service, for permit to install two 560 gal. underground steel tanks for gasoline for use in automobile service station, 3445 Hampton Ave.

ROAD MAINTENANCE EQUIPMENT — **Helena, Mont.**—State, c/o State Hy. Dpt., Helena, soon takes bids road maintenance equipment, incl. motor patrols, graders, trucks, tractors with road-sweeping units, pressure tar pots, small air compressor, $60,000. A. W. Engel, state purch. agent.

TANKS, etc.—**New York, N. Y.**—Edward Bach Estate, 92 Morningside Ave., will purchase several 1,000 gal. underground gasoline tanks, pumps, for service station, 242 St. Nicholas Ave. J. Law, c/o owner, archt.

WATER PUMPER — **Port Leyden, N. Y.** — Village, Village Hall, R. Gaylord, mayor, plans purchasing water pumper for Fire Department. To exceed $1,000.

TANK—**Rochester, N. Y.**—Standard Oil Co. of New York, Genesee Bldg., Buffalo, H. M. Graves, mgr., plans purchasing 500 or 1,000 gal. tanks and pumps, for 2 proposed service stations, 892 North Clinton Ave., and corner of Clifford Ave. and North St. To exceed $1,000.

TRUCK, etc.—**Utica, N. Y.**—City, City Hall, H. R. Beebe, comr. Safety, plans purchasing small truck, for Fire Dpt., new automobile for fire chief, new police patrol car. To exceed $1,000. J. B. Shaw, city engr.

CEMENT, etc.—**Cleveland, O.**—City, F. Milton, purch. agt., soon takes bids 6,000 bbl. portland cement, 2,000 tons asphalt, paving cement, 750 tons asphalt brick filler, 5,000 ft. standstone curbing, 4,000 ft. granite curbing, 3,000 cu.yd. ready mixed concrete.

ROAD OIL—**Cleveland, O.**—City soon takes bids 325,000 gal. road oil.

AERIAL LADDER TRUCK—**Johnstown, Pa.**—City, F. Brsius, dir. Dpt. Public Safety, plans purchasing new aerial ladder truck, to replace unit destroyed by flood. $12,000. H. L. Wilson, city engr.

STEEL TANKS—**Phila., Pa.**—Socony Vacuum Oil Co., 58th St. and Schuylkill River, plans installing 500 gal. steel tanks, electric pump, air compressor, etc., in service station to be built at Germantown Ave. and Gravers Lane. To exceed $1,000.

ELECTRIC METERS—**Scranton, Pa.**—Scranton Electric Co., Scranton, F. C. Wise, ch. engr., plans purchasing 300 to 400 new electric meters to replace equipment ruined by flood waters. $5,000 or more.

BREAKERS, etc.—**London, Ont.**—Public Utilities Comm., City Hall, bids this month, for new sub-station breakers, $6,500 voted; and for transformer and protection for new Dominion building, $6,500 voted.

ROAD MACHINERY—**Woodstock, Ont.**—I. N. Metherall, road supt., Oxford Co., Court House, will soon purchase road machinery, $6,592 available.

BIDS ASKED

ELECTRICAL CONDUIT—**Petaluma, Calif.**—G. V. Roberts, city clk., taking bids 4,620 lin. ft. electrical conduit, inside diam. 1½ in., 6,368 lin.ft. B and S Hazard, 3,500 electric cable, single copper conductor, 17 combination, isolating transformers and disconnecting potheads.

CAST IRON PIPE—**Sacramento, Calif.**—H. G. Denton, city clk., taking bids furnishing 2,500 ft. c.i. pipe.

BITUMINOUS CONCRETE—**Wash., D. C.**—Apr. 20, by District Comrs., District Bldg., 20,000 tons bituminous concrete. $80,000.

CONCRETE, etc.—**Wash., D. C.**—Apr. 21, by District Comrs., District Bldg., 20,000 sq.ft. concrete for roadwork repairs and 20,000 sq. yd. concrete for sidewalks and alleys. $115,000.

†OVERHEAD TRAVELING CRANE—**Wash., D. C.**—Apr. 20, by General Purchasing Officer, overhead traveling electric crane.

TIMBER—**Florida**—Apr. 16, by State Road Dpt., Tallahassee, furnishing 39.0 MFBM treated structural timber (12 lb. treatment), 4,800 lin.ft. treated timber piling (20 lb. treatment), f.o.b. La Belle, for Project 953, Rd. 142, Glades Co. J. H. Dowling, state hy. engr., State Road Dpt., Tallahassee.

TRUCKS, etc.—**Florida**—Apr. 16, by State Road Dpt., Tallahassee, C. B. Treadway, ch., J. H. Dowling, state hy. engr., furnishing trucks, truck chassis, hydraulic hoists, pick-up trucks, crawler type tractor, wheel rollers, motor patrols, utility all steel truck body, truck type shovel, stump puller, etc.

CONDENSER TUBES—**Chicago, Ill.**—Apr. 15, by City, City Hall, furnishing, delivering 1,500 condenser tubes each 16 ft. 23/16 in. long, outside diam. ¾ in. gage, $5,000. O. E. Hewitt, city engr.

TRACTOR—**Chicago, Ill.**—Apr. 17, by Cook Co., County Bldg., furnishing, delivering 1 tractor equal to McCormick Deering 10-20. H. W. Donahue, city engr.

PORTLAND CEMENT, etc.—**Indianapolis, Ind.**—Apr. 16, by Indianapolis Railways, Inc., C. W. Chase, pres., Traction Terminal Bldg., 110 North Illinois St., 31,000 bbl. portland cement; 60,941 red oak cross ties creosoted treated; 104,116 medium grade steel tie plates; 3,456 tons 7¼ in. high open hearth No. 1 steel rails 62 ft. long; 9,400 steel plates; 1,348 kegs screw spikes; 93 kegs railroad track spikes; 1,400 sacks 100 lb. each, fine milled fire clay; 250,000 lb. Lake Michigan sand; 191,422 lin. Sect. B, inside rail filler; 191,422 ft. Sect. B outside rail filler; 2,222,200 No. 1 paving brick; one thousand two hundred 200-300 cu.ft. capacity tanks oxygen; 16 low air consumption pneumatic paving breakers with hose connections, for reconstructing 26 mi. street railway tracks. P.W.A. project.

EMULSIFIED ASPHALT—**Marshall, Ind.**—Apr. 15, by Town Bd., L. Overman, clk., 13,1 gal. emulsified asphalt.

ROAD MAINTAINERS, etc.—**Cedar Rapids, Ia.**—Apr. 16, by Linn Co., W. H. Behrens, engr., 2 road maintainers, 2 blade graders.

UNTREATED LUMBER, etc.—**Orange City, Ia.**—Apr. 14, by Sioux Co., M. J. Van Wyk, aud., 4 cars of untreated lumber; 2 cars treated lumber; 2 cars treated piling; 2 cars of treated posts; 5 tons dynamite; 5,000 electric blasting caps. K. L. Seliger, co. engr.

ROAD OILS, etc.—**Attleboro, Mass.**—City, P. Wks. Dpt., City Hall, taking bids furnishing road oils, binders, road tar products as required. To exceed $1,000.

†SWITCHBOARD—**Boston, Mass.**—Apr. 1, by U. S. Eng., Boston, furnishing, installing 4 panel electric switchboard. Circular 65.

ROAD MACHINERY—**Moorhead, Minn.**—Apr. 14, by J. C. Atkinson, aud. Clay Co., road construction and maintenance, machinery and snow removal. H. R. Grove, co. hy. engr.

†CONCRETE CURING SOLUTION—**Fort Peck, Mont.**—Apr. 15, by U. S. Eng., 3,500 gal. concrete curing solution, for surface treating, Fort Peck Dam. $1,000.

SUBSTATION EQUIPMENT—**Nebraska**—Apr. 21, by Loup River Public Power Dist., 230-13th St., Columbus, furnishing outdoor substation equipment for Monroe Hydro-Electric Power Station near Monroe, and for Columbus Hydro-Electric Power Station near Columbus, P.W.A. project.

WATER PIPE, etc.—**Omaha, Neb.**—Apr. 14, by Metropolitan Utilities Dist., furnishing, installing 250 ft. 36 in. c.i. water pipe, fittings, valves, vaults, etc., complete installing pumping unit.

†WOOD PILES—**Omaha, Neb.**—Apr. 16, by U. S. Eng., City Natl. Bank Bldg., 5,000 round wood piles, for Missouri River work.

MOTOR TRUCK—**Forestport, N. Y.**—Town Bd. taking bids furnishing highway motor truck equipped with dump body. $2,000.

EMULSION, etc.—**Cleveland, O.**—Apr. 14, by Bd. Comrs. Cuyahoga Co., furnishing 100,000 gal. emulsion, 1,000 tons asphaltic concrete binder and 46,000 gal. M-T-2 material.

TRANSMISSION and CONVEYING MACHINERY, etc.—**Grove City, Pa.**—Pine Twp. Coal Co. in market for transmission and conveying machinery, boilers, engine, etc., for coal mine to replace equipment, recently destroyed by fire.

BATCH PULLING MACHINE—**Washington, Pa.**—Jos. M. Sprigg's Sons, Inc., in market for 50 to 100 lb. batch pulling machine.

TRACTOR — **Wissinoming, Pa.** — J. Coates, 4704 Devereaux Ave., taking bids furnishing caterpillar type tractor, equipped with push blade for hy. work. To exceed $1,000.

AGGREGATE—**South Carolina**—Apr. 15, by State Hy. Dpt., Columbia, 580 tons coarse aggregate and 218 tons fine aggregate, f.o.b. Chappells.

SUPERHEATERS, etc.—**Madison, Wis.**—Apr. 22, by Bd. P. Wks., furnishing superheaters, soot blowers, feed water regulators, etc.

DIESEL ENGINES—**Vancouver, B. C.**—Caribou Gold Quartz Mining Co. Ltd., 543 Granville St., in market for 4,800 hp. in unit of 500 to 1,000 new Diesel engines for power house.

MINING EQUIPMENT—**Cobalt, Ont.**—Cobalt Properties Ltd. in market for considerable and varied mining equipment.

FANS, etc.—**Montreal, Que.**—G. Archambault, Ltd., 726 Atwater Ave., in market for five 22 in. fans capacity 4,000 cu. air ft. per minute; one 17 in. fan, 3,000 cu.ft. all with self closing shutters and motor; one 15 in. fan pully driven 2,000 cu.ft. capacity; one hot water heater to heat 2,000 cu.ft. air per minute, 100 degrees; 3 unit heaters, capacity 240,000 cu.ft. heat units per hour 1-3 hp. motor.

SAW MILL EQUIPMENT—**North Battleford, Sask.**—See "Industrial Buildings," under "Proposed Work."

CONTRACTS AWARDED

CABLE—**Beverly Hills, Calif.**—B. J. Firminger, city clk., City Hall, 94,000 ft. lead covered cable, to Crescent Insulated Wire & Cable Co., 945 East Pico Blvd., Los Angeles, $4,089. Bids Mar. 3. Noted Mar. 13, C. D.

†ASPHALTIC CONCRETE, etc.—**Los Angeles, Calif.** — U. S. Eng., 1206 South Santee St., 2,562.36 tons asphaltic concrete and 1,104 tons rock and oil premix, to Vernon Paving Co., Vernon, $9,524. Bids Feb. 20, awarded Feb. 27. Noted Feb. 27, C. D.

†CLAMPS—**Los Angeles, Calif.**—U. S. Eng., 751 South Figueroa St., furnishing 4 clamps

†*Federal Government*

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Materials, etc. (Continued)

complete with tie rods, Proposal 518, to Crellin Machine Co., 123 Llewellyn St., $2,225. Bids Mar. 24, awarded Mar. 26.

IRON AND STEEL CASTINGS, etc. — Los Angeles, Calif. — Metropolitan Water Dist., 306 West 3rd St., F. E. Weymouth, engr., Schedule 2, furnishing iron and steel castings, and Schedule 7, e.i. frames and covers for manholes, to Kinney Iron Works, 2525 East 49th St., Vernon, $9,648***Schedules 3 and 4, e.i. pipe and fittings, valves, etc., to U. S. Pipe & Fdry. Co., 417 South Hill St., $11,573***Schedule 10, welded wire mesh for gunite reinforcing, to Johns-Manville Co., 714 West Olympic Blvd., $34,196***Schedule 9, fabricated steel frames and covers for manholes, to Bethlehem Steel Co., East Slauson Ave., Vernon, $9,991***Schedule 8, miscellaneous fabricated steel vertical slide gate, structural steel, plates, rungs, etc., to Soule Steel Co., 6200 South Wilmington Ave., $1,893***Schedules 5 and 6, e.i. pipe, fittings, valves, etc., to Long Beach Iron Wks., 2020 West Anheim St., Long Beach, $6,224. Grand total $74,225. Bids Mar. 12, awarded Mar. 27. Rejected bids Mar. 12, Schedule 1, miscellaneous items of fabricated steel, eye bars, pipe, etc., all foregoing Spec. 148. Noted Feb. 28, C. D.

MOTOR GRADERS—Los Angeles, Calif.—A. J. Holm, city purch. agt., City Hall, furnishing 1 single drive, four wheel and five double drive eight wheel power controlled motor graders, Spec. 3483, to Harron, Rickard & McCone, 2205 Santa Fe Ave., $2,346 and $3,077 respectively. Bids Mar. 17, awarded Mar. 30. Noted Mar. 25, C.D.

PIPE COATING MATERIALS—Los Angeles, Calif.—Metropolitan Water Dist., 306 West 3rd St., F. E. Weymouth, engr., furnishing pipe coating materials, Schedule 1, f.o.b. cars bidder's plant, 7,500 gal. coal tar primer in drums, 400 gal. coal tar primer thinner in cans, 1,000 tons coal tar enamel in drums. Schedule 2, same as Schedule 1, F.A.S. vessel. Schedule 3 engineering services, for Colorado River Aqueduct, Spec. 151, to Reilly Tar & Chemical Co., 816 West 5th St., $43,203. Bids Mar. 11, awarded Mar. 27. Noted Mar. 20, C. D.

PRESSURE REDUCING VALVE — Los Angeles, Calif.—D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 South Bway., 1 pressure reducing valve, 20 in. concrete type, Spec. 1894, to S. Morgan Smith Co., c/o R. W. Lawton, 137 North Van Ness Ave., $2,028. Bids Mar. 16, awarded Mar. 24. Noted Mar. 24, C. D.

†**PUMP—Los Angeles, Calif**—Indian Irrigation Service, 751 South Figueroa St., furnishing one 35 hp. Diesel engine designed to operate deep well pump, Invitation 0222, to Caterpillar Tractor Co., 600 West Washington St., East Peoria, $2,376. Bids Mar. 6, awarded Mar. 24.

ROCK and OIL, etc.—Los Angeles, Calif.—H. E. Russell, purch. agt., Los Angeles Co., 524 North Spring St., furnishing 4,500 tons medium premix rock and oil paving materials, f.o.b. Hooper Ave., 64th to 78th Sts., to Vernon Paving Co., 3200 East Vernon Ave., $8,775. Bids Mar. 26, awarded Mar. 28.

STEEL CONDUIT—Los Angeles, Calif.—D. P. Nicklin, purch. agt. Dpt. Water, furnishing hot dipped galvanized steel conduit, incl. 5,000 ft. 1¼ in., 6,000 ft. ¾ in., 3,000 ft. 1 in., 2,500 ft. 1¼ in., 7,000 ft. 1½ in., 2,000 ft. 2 in., 1,000 ft. 3 in., 500 ft. 4 in. conduit, Spec. 1902, to Associated Wholesale Electric Co., 1111 Santee St., $3,260. Bids Mar. 23, awarded Mar. 26.

†**TAMPING ROLLERS, etc.—Los Angeles, Calif.**—U. S. Eng., 751 South Figueroa St., 2 ton tamping rollers, to M. P. McCaffrey Co., 1430 North Spring St., $1,054; steel rods, to Cutting Eng. Co., 2035 East 8th St., Vernon, $1,915. Bids Mar. 23. Noted Mar. 19, C. D.

†**TRACTOR, etc.—Los Angeles, Calif.**—U. S. Indian Service, 751 South Figueroa St., 1 tractor, track laying, type, gasoline engine, 75 DBHP, and 1 scraper, 8 cu.yd. cable controlled power unit, f.o.b. Numana, Nev., to Caterpillar Tractor Co., 150 West Jefferson St., $11,208. Bids Mar. 6, awarded Mar. 25.

TRUCK—Los Angeles, Calif.—D. P. Nicklin, purch. agt. Bureau Power & Light, 207 South Broadway, one 2½ ton truck complete with convertible dump body, Spec. 1879, to Moreland Motor Truck Co., 2325 South Main St., $2,208. Bids Mar. 19, awarded Mar. 26.

CRUSHER STONE, etc.—New Haven, Conn.—City Dpt. Parks, Hall of Records, to Foxon Trap Rock Co., Inc., Foxon Rd., A. N. Farnham Estate, 405 Crescent St., and C. W. Blakeslee & Sons, Inc., 58 Waverly St., furnishing crushed stone requirements for 1 year, 2 in. at $1.10, 1 in. at $1, ¾ in. at $1.50. Bids Mar. 25. Noted Mar. 23, C. D.

CABLE—Chicago, Ill.—City, City Hall, 20,000 ft. single conductor No. 8 A.W.G., 5,000 volt rubber insulated, lead sheathed, flexible steel armored, duck covered cable; 100,000 ft. single conductor No. 8 A.W.G., 5,000 volt rubber insulated, lead sheathed cable; 20,000 ft. 10 conductor, 600 volt rubber insulated, lead sheathed cable with 9 No. 14 and one No. 10 conductors, to American Steel & Wire Co., 208 South LaSalle St., $18,460. Bids Mar. 16, awarded Mar. 25. Noted Mar. 23, C. D.

AIR COMPRESSORS—Ames, Ia.—State Hy. Comn., Ames, 3 air compressors, to Motor Tool Supply Co., 413 11th St., Des Moines, $505*** 9 compressors, to Midwest Timmerman Co., Dubuque, $1,640***5 compressors, to Waterloo Constr. Co., Waterloo, $813***2 compressors, to Royer Mfg. Co., Janesville, $355***5 compressors, to Iowa Mchy. & Supply Co., 317 Court St., Des Moines, $809***5 compressors, to Repass Auto Co., Waterloo, $731***2 compressors, to James W. Bell Co., Cedar Rapids, $364***5 compressors, to A. T. McDonald Co., 802 Morgan St., Des Moines, $755. Grand total $5,971. Bids Mar. 30, awarded Mar. 31. Noted Mar. 25, C. D.

SIGN POSTS—Ames, Ia.—State Hy. Comn., Ames, 4,000 wood sign posts, to E. S. Gaynor Lumber Co., Sioux City, $2,080. Bids Mar. 30, awarded Mar. 31.

RAILROAD TIES—New Bedford, Mass.—City, Water Bd., Municipal Bldg., 4 carloads of railroad ties, creosoted southern pine, to Green & Wood, Inc., Pine St., New Bedford. Bids Mar. 30, awarded Mar. 31. Noted Mar. 26, C.D.

ASPHALT CEMENT, etc.—Springfield, Mass.—City, Dpt. Streets & Eng., C. W. Phillips, supt. Administration Bldg., furnishing asphalt cement, to American Bitumuls Co., 229 Broadway Pl., Everett***penetration asphalt, to Colonial Beacon Oil Co., 30 Beacham St., Everett***fine asphalt sand, to R. Ducharme, Chicopee Farms***washed gravel, to Birnie Gravel Co., Ludlow***sewer brick, to Hampshire Brick Co., Holyoke***sewer castings, to Fleming Fdry. Co., 164 Birnie Ave.***furnishing 65,000 ft. vitr. tile pipe, to Cook Builders Supply Co., 41 Cypress St.***12,000 bbl. cement, to Sullivan Masons Supply Co., 39 Colton St., at $2.41 per bbl. Bids Mar. 10. Noted Mar. 2, C. D. —Mar. 5, E. N.-R.

PIPE and FITTINGS—Swampscott, Mass.—Town, Water & Sewage Bd., brass pipe and fittings for Water Bd., to E. C. Phillips, 501 Humphrey St., Swampscott. Noted Mar. 24, C.D.

FIRE TRUCK—Appleton, Minn.—Village, S. Johnson, village recdr., 1 triple combination fire truck, to Buffalo Fire Appliances Co., 44 Central Ave., Buffalo, N. Y., $5,000. Bids Mar. 2. Noted Feb. 26, C. D.

ROTARY SNOW PLOW—Blue Earth, Minn.—Faribault Co., G. G. Nusche, aud., furnishing 1 rotary snow plow, to Klauer Mfg. Co., Dubuque, Ia., $9,500; truck, to W. H. Ziegler Co., 2331 University Ave. S.E., Minneapolis, $5,513. Bids Mar. 17. Noted Mar. 11, C. D.

MOTOR PATROLS—Faribault, Minn.—Rice Co., furnishing 1 motor patrol, to Austin-Western Road Mchy. Co., 2328 Territorial Rd., St. Paul, $5,000; 1, to W. H. Ziegler Co., 2331 University Ave. S.E., Minneapolis, $5,000. Bids Mar. 10. Noted Feb. 5, C. D.—Feb. 13, E. N.-R.

BLADE GRADERS—Hastings, Minn.—Dakota Co., 1 pull-type blade grader with 14 ft. blade, to J. D. Adams, 328 North 1st St., Minneapolis, $1,296***and 1, to Austin-Western Road Mchy. Co., 2328 Territorial Rd., St. Paul, $1,325. Bids Mar. 16. Noted Feb. 27, C. D.—Mar. 5, E. N.-R.

BRICK—Minneapolis, Minn.—City, furnishing 350,000 paving brick 2¼ in., and 1,000,000 brick 3 in., to Purington Paving Brick Co., Galesburg, Ill., $35 and $40 per 1,000 respectively with $1 per 1,000 off for cash. Bids Mar. 23. Noted Mar. 11, C. D.

PORTLAND CEMENT, etc. — Minneapolis, Minn.—City, 40,000 bbls. portland cement, to Landers-Norblom-Christensen Co., 800 Builders Exch. Bldg.***15,000 bbl., to Eide Swanson Bros., 115 Colfax Ave. N.***5,000 bbl., to Berg & Hanson Co.***2,500 bbl., to Twin City Brick Co., 529 2nd Ave. S***15,000 bbl., to L. W. Northfield Co., 2542 Central Ave.***20,000 bbl., to Minneapolis Builders Supply Co., 721 Lumber Exchange***5,000 bbl., to City Builders Service Co., 1868 East 24th St.***15,000 bbl., to Winder-Klein-Donohue Co., 319 2nd Ave. S***5,000 bbl., to Richfield Yard, 66th St. and Pleasant Ave., all at $2.80 per ♦bbl. gross incl. sacks f.o.b. cars net with 5 per cent disc. for cash $2.26*** 4,500 tons mineral filler, to Landers-Norblom-Christensen Co., 800 Builders Exch. Bldg., $6.75 per ton gross f.o.b. cars at City Asphalt plant or $4.41 per ♦ net ***one 2 ton platform truck for Waterworks Dpt. to Anderson Motor Co., 1201 East Lake St., Minneapolis, 1,487 gross or 1,105 net allowing for trade-in. Bids Mar. 19. Noted Mar 11, C. D.

♦**PIPING, etc.—Madison, Wis.**—Treas. Dpt. Procurement Div., Madison, piping and radiators for village hall, Shorewood, to American Plumbing & Heating Supply Co., 1576 West National Ave., Milwaukee, $86 and $149 respectively*** fittings, to Rundle Spence Mfg. Co., 445 North 4th St., Milwaukee, $117**lumber, f.o.b. Spring Park, Milwaukee, to J. Eller Lumber Co., 3016 West Chambers St., Milwaukee, $562*** lumber, to Steinman Lumber Co., 500 East Keefe Ave., Milwaukee, $370. Grand total $1,284. **W.P.A.**

VITRIFIED CLAY PIPE—Minneapolis, Minn.—City, season's supply vitr. sewer pipe for Sewer Dpt., to L. W. Northfield Co., 2542 Central Ave., Minneapolis, on basis of delivery to ditch as required; 100 tons sewer castings, to Crown Iron Wks. Co., 1229 Northeast Tyler St., $32.90 per ton for manhole rings and covers and $36.35 per ton for catch basins. Bids Mar. 24. Noted Mar. 20, C.D.

TURBINE PUMP—New Ulm, Minn.—City, 1 deep well turbine pump, to Worthington Pump & Mchy. Corp., 1012 Pioneer Bldg., St. Paul, $1,051. Bids Feb. 26. Noted Feb. 19, C. D.

MOTOR PATROLS—Preston, Minn.—Fillmore Co., C. V. Michener, aud., 2 motor patrols, to J. D. Adams Co., 217 South Belmont Ave., Indianapolis, Ind., $4,490 each. Bids Mar. 11. Noted Mar. 5, C. D.

†**GALVANIZED ANNEALED STRAND—Kansas City, Mo.**—U. S. Eng., 232 Mfg. Exch. Bldg., 620,000 ft. galvanized annealed strand f.o.b. contractor's plants, to A. Leschen & Sons Rope Co., 5909 Kennerly St., St. Louis, Mo., $2,230***to MacWhite Co., 2927 14th Ave., Kenosha, Wis., $2,527***and to J. A. Roebling & Son, 205 Wacker Dr., Chicago, Ill., $2,527. Grand total $7,284. Bids Mar. 19. Noted Mar. 17.

†**GALVANIZED ANNEALED STRAND—Kansas City, Mo.**—U. S. Eng., 232 Mfg. Exch. Bldg., furnishing 210,000 ft. ¼ in. galvanized annealed strand, f.o.b. contractors plant, to Wickwire Spencer Steel Co., 41 East 42nd St., New York, N. Y., $2,942. Bids Mar. 25, awarded Mar. 26. Noted Mar. 17, C.D.—Mar. 19, E.N.-R.

†**GALVANIZED ANNEALED STRAND—Kansas City, Mo.**—U. S. Eng., 232 Mfg. Exch. Bldg., 210,000 ft. ¼ in. galvanized annealed strand, f.o.b. contractors plant, to MacWhite Co., 2927 14th Ave., Kenosha, Wis., $2,638. Bids Mar. 23. Noted Mar. 17, C. D.

†**GALVANIZED ANNEALED STRAND—Kansas City, Mo.**—U. S. Eng., 232 Mfg. Exch. Bldg., Kansas City, 210,000 ft. ¼ in. galvanized annealed strand, f.o.b. contractors plant, to Indiana Steel & Wire Co., Muncie, Ind., $2,638. Bids Mar. 27, Awarded Mar. 28. Noted Mar. 20, C.D.

†**GALVANIZED ANNEALED STRAND—Kansas City, Mo.**—U. S. Eng., 232 Mfg. Exch. Bldg., furnishing 210,000 ft. ¼ in. galvanized annealed strand, f.o.b. contractors plant, to Indiana Steel & Wire Co., Muncie, Ind., $2,955. Bids Mar. 26, awarded Mar. 28. Noted Mar. 17, C.D. —Mar. 19, E.N.-R.

†**PIPE—New York, N. Y.**—Treas. Dpt. Procurement Div., 76 9th Ave., 200 tons c.i. pipe, to Warren Fdry. & Pipe Co., Phillipsburgh, N. J.***320 tons c.i. pipe, to Florence Pipe & Fdry. Co., Florence, N. J.***340 tons c.i. pipe, to U. S. Pipe & Fdry. Co., Burlington, N. J.

PICKUP SWEEPERS—Syracuse, N. Y.—Bd. Contr. & Supply, City Hall, 2 street sweepers, motor driven, to Elgin Sweeper Corp., Elgin, Ill., $13,580. Bids Mar. 16. Noted Mar. 13, C. D.

SEWER PIPE—Utica, N. Y.—City, City Hall, sewer pipe for sewers in Madison Ave., Sherman and Armory Drs., to Mid-State Builders, Inc., Utica, $5,136. **W.P.A.** Awarded Mar. 24. Noted Mar. 20, C. D.—Mar. 26, E. N.-R.

TRACTOR—Beach, N. D.—Golden Valley Co., M. E. Smith, aud., 1 Diesel tractor, to Tractor & Equipment Co., Sidney, Mont., $4,600. Bids Mar. 3.

MOTOR PATROLS, etc.—Cando, N. D.—Towner Co., 1 motor patrol and elevating grader, to Dakota Tractor & Equipment Co., Fargo, $4,955 and $3,335 respectively***1 motor patrol, to Northwestern Sheet & Iron Wks., Wahpeton, $3,592. Grand total $11,852. Bids Mar. 3. Noted Feb. 26, C. D.

GRADERS—Wahpeton, N. D.—Richland Co., G. J. Fischer, aud., two heavy duty motor graders, to Northwestern Sheet Iron Wks., Wahpeton, $4,655 each. Bids Mar. 5. Noted Feb. 26, C. D.

GRADER—Minnewaukan, N. D.—Benson Co., furnishing 1 grader, 14 ft. blade, about 10,000 lb. weight, hand control, to Dakota Tractor & Equipment Co., Fargo, $1,550. Bids Mar. 4. Noted Feb. 26, C. D.

ROAD OIL—Cincinnati, O.—Contractors Materials Co., Provident Bank Bldg., furnishing road oil, to Cincinnati Quarries Co., 6 East 4th St., $2,480. Bids Feb. 19, awarded Mar. 14. **(Correction**—Company awarded contract.) Noted Mar. 18, C.D.—Mar. 26, E.N.-R.

STONE — Carlisle, Pa. — Hys. Maintenance Superintendent Cumberland Co., furnishing stone for emergency repairs to hys. damaged by frost, etc., to J. F. Sours, Carlisle, $263***to H. W. Shaull & Sons, Mechanicsburg, $239***to Strayer & Lefever Bros., Dillsburg, $113***to Chambersburg Stone Co., Chambersburg, $56 ***to Hempt Bros., Camp Hill, $442. Grand total $1,113. Bids Mar. 16. Noted Mar. 12, C. D.

STONE — Chambersburg, Pa. — Hys. Maintenance Superintendent Franklin Co., furnishing stone for emergency repairs to hys. damaged by frost, etc., to C. Earl Brown, 170 North 2nd St., Chambersburg, $748***to A. Ebersole, 545 North Franklin St., Chambersburg, $1,080*** to George H. Diehl, Mercersburg, $803***to P. Eshelman, RD 2, Greencastle, $490***to J. S. Brumbaugh, Lincoln Way East, Chambersburg, $1,304***to H. T. Goetz, Greencastle, $680. Grand total $5,105. Bids Mar. 16. Noted Mar. 12, C. D.

STONE—Gettysburg, Pa.—Hys. Maintenance Superintendent Adams Co., furnishing stone for emergency repairs to hys. damaged by frost, etc., to H. Gingell, Fairfield, $861***W. V. Sneeringer, Littlestown, $304***to J. S. Teeter & Sons, Inc., Gettysburg, $432***to J. F. Sours, Carlisle, $80***to Strayer & Lefever Bros., Dillsburg, $288***to Steacy & Wilton Co., Wrightsville, $701***to Adams Stone Products Co., Inc., R.D. 5, Hanover, $444. Grand total $3,110. Bids Mar. 16. Noted Mar. 12, C. D.

STEEL RAILS—Wheeling, W. Va.—Wheeling & Lake Erie R.R., 2,500 tons steel rails and quantity of track fastenings, to Carnegie Illi-

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†*Federal Government.*

Materials, etc. (Continued)

nois Steel Co., Carnegie Bldg., Pittsburgh, Pa., $85,000.

†PORTLAND CEMENT, etc.—**Madison, Wis.**—Treas. Dpt., Procurement Officer, Madison, 300 bbl. portland cement, to J. Druecker & Sons Co., 1325 East Capitol Dr., Milwaukee, $2.50 with 5/10 disc.***reinforcing steel, to W. J. Holliday & Co., Hammond, Ind., $317***pipe and fittings, f.o.b. Jacobs Park, Wauwatosa, to F. R. Dengel Co., 1134 North 4th St., $325***1,800 ft. armored cable f.o.b. Brown Deer Park, to A. M. Kaiing Co., 1321 North 3rd St., Milwaukee, $1,242***armored cable, f.o.b. Jacobus Park, Wauwatosa, to Federal Steel Sash Co., 125 East Wells St., Milwaukee, $363, all for **W.P.A.** projects.

CATERPILLAR TRACTOR—**Manitowoc, Wis.**—City, furnishing 75 hp. Diesel powered caterpillar tractor, to Hamacheck-Bleser Co., Manitowoc, $7,210. E. F. Walter, Manitowoc, engr.

CEMENT—**Milwaukee, Wis.**—Milwaukee Co. Hy. Dpt., 1,600 bags cement, to Capitol Building Supply Co., 3522 North Fratney St., $2.74 per bbl less 40c., 5-10***2,000 bags, to Wauwatosa Fuel & Supply Co., 7700 Harwood Ave., Wauwatosa, same price***4,800 bags, to Tews Lime & Cement Co., 1136 East North Ave., and W. H. Pipkorn Co., 1548 West Bruce St., same price***800 bags, to Berthelet Pipe & Supply Co., 820 West Montana St., same price. Bids Mar. 27. Noted Mar. 24, C. D.

†CENTRIFUGAL PUMP, etc. — **Milwaukee, Wis.** — Treas. Dpt., c/o Procurement Officer, centrifugal pump for Brown Deer Park, to Fairbanks Morse Co., 404 North Plankington Ave., $615, 125 bbl. portland cement, paper bags for various locations in Milwaukee, to Tews Lime & Cement Co., 1136 East North Ave., $2.52 per bbl., all for **W.P.A.** projects.

LATHES—**Milwaukee, Wis.**—City, furnishing heavy duty lathe, to E. L. Essley Mchy. Co., 412 North Plankington Ave., $7,094; engine lathe, to Milwaukee Mchy. Co., 131 South 1st St., $1,986. Bids Feb. 27, awarded Mar. 27. Noted Feb. 18, C. D.

†SAND, STONE, etc.—**Milwaukee, Wis.**—U. S. Eng., 900 tons sand and 1,700 tons stone, to Construction Aggregate Co., 33 North LaSalle St., Chicago, Ill., at 55c. and 65c. per ton respectively, total $1,600***750 bbl. cement, to H. Neitring, Grand Haven, Mich., $1,733, all delivered to Grand Haven, Mich. Bids Mar. 24, awarded Mar. 31.

DUMP TRUCK, etc.—**Port Washington, Wis.**—City, furnishing dump truck, snow plow, to J. Schmit, Port Washington, $4,175. Bids Feb. 28.

FOREIGN

Argentina, Buenos Aires—May 6, by Argentine Sanitary Works Department, supplying 12 pumping sets.

Australia—Government of Western Australia, **Cue**, plans constructing 22 mi. railroad from Cue to Coodardie***Government of New South Wales, **Wynyard**, voted $5,000,000 for railway linking Wynyard with circular quay***A. Gordon Guttridge, Melbourne, plans sewerage scheme for **Warracknabel** municipality, $460,340***W. J. Reinhold, Briolbane, plans constructing swimming pool, filtration and sterilizing plant, pipes and all equipment, for **Dalby** municipality water supply***Metropolitan Bd. Whs., **Melbourne**, plans surburban drainage scheme, $484,000***Government of Victoria, **Merbein**, provides $2,500,000 for drainage works in Mildura Irrigation area***Redcliffe, J. Wilson, plans supply for municipality incl. well sinking and exploitation and chain of lagoons 5 mi. from town***Metropolitan Water Supply & Sewerage Bd., **Sydney**, voted $27,405,000 for constructing sewerage works in Southern and Western suburbs***Rockdale, Sydney, Metropolitan Water Supply & Sewerage Bd. plans constructing ocean outfall sewer from Rockdale to Ocean at Long Bay, $8,455,000***Victoria Government, State Rivers & Water Supply Comn., **Mornington**, provides $800,000 for water supply extensions, to Droman, Rosebud, Rye, Sorrento and Portsea, each municipality will construct buildings and essential equipment themselves.

British Guiana, Georgetown — Colonial Government preparing plans constructing concrete and stone seawall adjoining Lusignan Sugar estate, $700,000.

England — Birmingham, Municipality plans hospital center, $6,250,000. Now available, $3,850,000***London and Northern Electric Railway, **Doncaster**, plans new terminal, $1,250,000***Sheffield Brick Co., Ltd., A. L. Wing, mgr., **Sheffield**, plans replacing 2 plants during 1936***Marston Ridgmont Properties, Ltd., D. J. Brannon, secy., 23 Lawrence Lane, Cheapside, E. C., plans housing development, **London**, $800,000.

England—Apr. 23, by H. Bailey Chapman, clk. County Boro of Burton-on-Trent, **London**, supplying 5 Lancashire boilers, 30 ft. x 7 ft.; 2 sets Green's economisers, water softening plant, pipes, etc.***I. F. Crowley, Westminster House, Great George St. **London**, taking bids erecting and equipping office building for Irish Wire Products, Ltd., Limerick, Ireland***Brybo Steel Co., Ltd., **Wretham**, plans installing 50 ton open hearth furnace and metalmixer of 150 ton capacity***F. H. Tomes, 50 Wide Bargate, **Boston (Lincolnshire)**, on behalf of Witham and Steeping Rivers Catchment Basin Bd., in market for new, second hand rails, not less than 1 mill portable railway track, 24 in. gage, 2 way points, double side tipping wagons, 2 petrol parafin rail tractors, etc.***North Eastern Housing Assn., **Hartlepool**, plans 374 houses, $800,000.

England—Portsmouth, Municipality extending power plant, incl. 2 water tube boilers, complete with stokers, superheaters, economizers, air heaters, grit collecting equipment and coal and ash handling plant, to Clarke, Chapman & Co., Ltd., Gateshead-upon-Tyne, $767,000***Sheffield Municipality, power equipment to Reynolds & Co., Ltd., Hebburn-upon-Tyne, $430,000*** Puttnam Aircraft Co., Ltd., M. E. Cramb, secy., **London**, 1 Hanover St., plans erecting plant for manufacture of aircraft, etc.***Garden Aero Engines, Ltd., c/o H. H. S. Wright, 18 Bloomsbury Square, W. C., **London**, plans constructing plant. S. G. Wornum, 36 Devonshire St., W., archt., listing names for firms wishing to bid on heavy sheet steel works, incl. 150 tons large welded steel arches.

England, London — London & Northwestern Railway, London, England, soon lets contract constructing railway station and theatre, Euston Rd., $25,000,000.

India, Malakand — North Western Frontier Province supplying 32 mi. double circuit and 70 mi. single circuit 66 k.v. cable.

New Zealand — Waikato Municipality plans bridge connection, $350,000; **Waipa**, County Council votes $1,255,000 for 72 mi. road construction. J. W. Civil, Te Awamuted, preparing plans.

New Zealand, Wellington—June 5, by Director General, Stores Division, Posts & Telegraph Dpt., supplying 8 mi. cable, single solid conductor, rubber insulated, taped and braided, black; June 4, supplying 300 strips connectings 25x2.

Peru, Lima—Municipality constructing steel bridge to Cleveland Bridge & Eng Co., Ltd., Darlington, England, $80,000.

Scotland, Campbelltown — Municipality plans constructing 300 houses on 22¼ acre site, at Dalarumun. Burgh Surveyor preparing plans.

Scotland, Saltcoats—Municipality plans 314 houses, $650,000. Burgh Surveyor preparing plans.

South Africa, Johannesburg — T. H. Watermeyer, mgr., South African Railways and Harbor Administration, is in market for 200 ton hydraulic press.

PUBLIC BUILDINGS

PROPOSED WORK

Calif., Berkeley — University of California, plans by G. W. Kelham, 315 Montgomery St., San Francisco, general reconstruction at Stephens Union Building, $150,000. H. J. Brunnier, Sharon Bldg., and W. L. Huber, 1 Montgomery St., San Francisco, engrs.

★ **Calif., Los Angeles**—Los Angeles Bd. Educ., Chamber of Commerce Bldg., plans by H. L. Gogerty & C. E. Noerenberg, 6272 Yucca St., Hollywood, for West Adams High School Exposition on 22 acre site, Blvd. and Palmdale

Calif., Los Angeles—Los Angeles Bd. Educ., Chamber of Commerce Bldg., plans by Austin & Ashley, Chamber of Commerce Bldg., new Junior High School buildings, Lincoln Park Dist. $400,000. G. H. Schulte, Chamber of Commerce Bldg., structural engr. R. E. Phillips, 603 Architects Bldg., mechanical engr. C. A. Sanborn & Co., 357 South Hill St., electrical engr. Noted Mar. 10, C.D.—Mar. 12, E. N.-R.

D. C., Wash.—District Comrs., District Bldg., rejected bids Mar. 17, remodeling and constructing school additions. Will readvertise. Noted Mar. 19, C. D.—Mar. 5, E. N.-R.

Ind., Decatur—Municipality soon takes new bids electric turbo generator for power and light plant. Total $110,000. Former bids rejected. Bevington-Williams, 1139 K. of P. Bldg., Indianapolis, engr. Noted Mar. 10, C. D.—Mar. 12, E. N.-R.

Ia., Rock Rapids — Municipality plans constructing electric power plant. $185,000. Black & Veatch, 405 East 13th St., Kansas City, Mo., engrs.

Kan., Iola—City soon takes bids light plant improvement, incl. new steam generating equipment. $225,000. Paulette & Wilson, Salina, engrs. Noted Jan. 24, C. D.—Jan. 30, E. N.-R.

Mass., Holyoke—City, W. P. Yoerg, mayor, City Hall, plans repairing foundations, brick walls and equipment of 2 story, basement, gas and electric plant damaged by flood, on Connecticut River. To exceed $40,000. Some new equipment required. Private plans.

Mass., Taunton—City, T. W. Scanlon, supt. P. Buildings, City Hall, plans new heating plant in Washington School, heating plant improvements in Weir School; sprinkler systems in various schools. To exceed $23,000.

Mass., Wellesley—Town, R. E. Blakeslee, chn. Building Comn., Wellesley, voted to select architect and proceed with former W.P.A. project, brick, steel and stone high school, Kingsbury St. Noted Dec. 18, 1934, C. D.—Dec. 20, 1934, E. N.-R.

Mich., Alpena—City plans being completed by J. Goodeyne, Bay City, city hospital building, $160,000.

★ **Mo., Kansas City** — City, final plans by Wight & Wight, 400 1st Natl. Bank Bldg., 6 story, basement, 125x130 ft. municipal court building, 12th and Locusts Sts. $500,000.

Mo., Plattsburg—Plattsburg School Di[illegible] plans reconstructing rein.-con., brick hi[illegible] school, destroyed by fire. $150,000.

†**N. Y., Baldwinsville**—Treas. Dpt. at offi[illegible] Sup. Archt., Wash., D. C., making plans a[illegible] takes bids about June, brick, steel U. S. Po[illegible] Office, plain found., River St. $66,000.

N. Y., Glens Falls—Glens Falls Hospital, [illegible] Park St., plans by M. L. Crandall, 200 G[illegible] St., Glens Falls, constructing 4 story additi[illegible] to hospital and extensive renovation of press[illegible] building, 88 Park St. $400,000.

N. Y., Hobart—Bd. Educ., North Harpersfiel[illegible] plans Central School. To exceed $140,00[illegible] Central School Dist. to be formed. Archite[illegible] not appointed. A. T. Hamilton, North Harper[illegible] field, district supt. Schools.

★ **N. Y., Middletown**—Bd. Educ. postpone[illegible] construction of school, Wisner Ave. $798[illegible] 225. Project temporarily in abeyance. P.W.A[illegible] funds applied for but will depend on Congre[illegible] sional action in appropriating more funds f[illegible] P.W.A. projects. Present funds exhausted. [illegible] R. Graham, 25 Prospect St., archt. Note[illegible] Sept. 16, C. D.—Sept. 19, E. N.-R.

N. Y., Ocean Beach—Village granted fra[illegible] chise to Long Island Lighting Co., the permi[illegible] automatically cancels negotiations for $96,00[illegible] P.W.A. loan and grant to build electric ge[illegible] erating plant. Company will install electricit[illegible] in community. Noted Jan. 21, C. D.—Jan. 2[illegible] E. N.-R.

N. Y., Panama—Bd. Educ., plans by R. Free[illegible] burg, 1105 West 3rd St., Jamestown, construct[illegible] ing 2 story, basement, steel central school build[illegible] ing. To exceed $140,000. **Maturity indefinite.**

★ **N. Y., Rochester**—Bd. Supervs. Monroe Co[illegible] County Bldg., will not construct count[illegible] penitentiary, $995,000. Project abandoned[illegible] Noted Jan. 10, C. D.—Jan. 16, E. N.-R., under "Contracts Awarded."

R. I., Providence—City, D. L. Richardson M.D., supt. of Chas. C. Chapin Hospital, plans 2 elevators and fluoroscope in Chas. V. Chapin Hospital.

Tex., Big Spring—Bd. Educ., c/o C. W. Blankenship, pres., sketches semi-fireproof Junior College building, $150,000. Architect appointed soon.

Tex., Georgetown—City, J. R. Black, mgr., plans improvements to present light and power plant, probably include some new generating equipment, power line extensions, dynamos, etc. $30,000. Engineer, c/o City, engr.

†**Tex., Orange** — Treas. Dpt. at office Sup. Archt., Wash., D. C., plans brick, rein.-con., steel U. S. Post Office, plain found. $75,000. Site selected.

★ **Man., Winnipeg**—Municipality makes formal application to Provincial Legislature for permission to hold election on housing scheme, $1,500,000. Noted Dec. 19, C. D.

Ont., Kingston—Canadian Natl. Ry., Union Station, Toronto, plans constructing new station. $150,000. Architect and engineer not appointed.

Ont., London—University of Western Ontario Bd. Governors, S. Fox, dean, plans constructing gymnasium and field house. $150,000.

Ont., Owen Sound—Municipality, C. C. Middleboro, clk., making plans constructing central heating plant.

BIDS ASKED

Calif., San Diego—See "Contracts Awarded."

†**Calif., Ukiah**—May 7, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $83,000.

†**Conn., Clinton**—Apr. 30, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, $66,000. Noted Jan. 22, C. D.—Jan. 30, E. N.-R.

†**D. C., Wash.**—Apr. 27, by Treas. Dpt. at office Sup. Archt., Wash., D. C., motor generator set, etc. for U. S. I. C. C. and Labor buildings.

Ind., Richmond—Apr. 23, by Bd. Educ., W. A. Crum, pres., constructing new heating plant, ventilation system and temperature control, 2 steel boilers, 2 pipe vacuum heating system, air compressor and tanks at Starr School. $12,000. J. L. Hamilton, 814 Tower Court, Chicago, archt.

†**Ia., Jefferson**—May 1, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $65,000.

†**Ky., Fort Knox**—Con. Q. M., Fort Knox, taking bids quarters and maintenance building. Est. about $50,000.

†**La., Winnsboro**—Apr. 30, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $64,000.

Md., Silver Spring—Bd. Educ., Montgomery Co., Court House, Rockville, taking bids (bids extended from Mar. 30), 2 story auditorium and gymnasium addition at Eastern Suburban High School. $150,000. P.W.A. project. H. W. Cutler, 1108 16th St. N.W., Wash., D. C., archt. Noted Mar. 20, C. D.—Mar. 26, E. N.-R.

Mass., Gardner—Apr. 14, by Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, furnishing, installing sprinkler system and electric signal system at State Hospital. Est. $18,200. Fay, Spofford & Thorndike, 44 School St., Boston, engrs.

†**Mass., Nantucket**—Apr. 13, by U. S. Coast Guard, Wash., D. C., constructing 1 story, basement, 66x87 ft., brick garage, workshop, boat-

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†*Federal Government*

Public Buildings (Continued)

house, launchway, at U. S. Coast Guard Station. $37,000.

†**Minn., Minneapolis**—Apr. 28, by Treas. Dept. at office Sup. Archt., Wash., D. C., repairing and remodeling elevators in old U. S. Post Office.

†**Mo., St. Louis**—Apr. 14, by Treas. Dept. at office Sup. Archt., Wash., D. C., changes in ventilating ducts for Federal Court House and Custom House at 12th Blvd. and Market St. Private plans.

Mo., St. Louis—Apr. 28, by Bd. P. Service, City Hall, furnishing, installing complete X-ray equipment in Homer G. Phillips City Hospital for Colored. $36,000. P.W.A. project. W. C. E. Becker, city engr.

†**Mo., St. Louis**—Apr. 27, by Treas. Dept. at office Sup. Archt., Wash., D. C., miscellaneous changes in U. S. Court House and Custom House. $155,000.

†**Mo., Vandalia**—Apr. 28, by Treas. Dept. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $65,000.

N. Y., Arkport — Apr. 18, by Union Free School Dist. 1, Hornellville, general contract, plumbing, heating, electrical work for school. $140,000. P.W.A. project. R. A. Freeburg, 1105 West 3rd St., Jamestown, archt. Noted Dec. 27, C. D.—Jan. 2, E. N.-R., under "Contracts Awarded."

★ **N. Y., Binghamton**—City, C. A. Harrelle, mgr., City Hall, bids about Apr. 10, constructing school, Howard Ave. $800,000. P.W.A. project. L. J. Kaley, 70 Court St., Binghamton, archt. Noted Feb. 17, C. D.—Feb. 20, E. N.-R.

N. Y., Brooklyn—Apr. 16, by Dpt. Hospitals, Municipal Bldg., New York, general construction power and piping work, electrical work for additions, alterations and additional equipment and pipe tunnel to power plant, Kings County Hospital, Winthrop St. $145,-545. L. E. Jallade, 597 5th Ave., New York, archt.

N. Y., New Berlin — Apr. 22, by Central School Dist. 1, general contract plumbing, heating, electrical work for school on South Main St. $286,000. P.W.A. project. Bley & Lyman, 505 Delaware Ave., archts. Noted Nov. 26, C.D.—Nov. 21, E. N.-R.

★ **N. Y., New York**—Apr. 14 (extended date), by Dpt. Hospitals, 125 Worth St., New York, general contract, elevator, plumbing and kitchen equipment, refrigeration, heating, ventilating for superstructure central nurses' residence at Welfare Island. $1,345,000. P.W.A. project. Morris & O'Connor, 101 Park Ave., archts. Noted Mar. 17, C. D.—Mar. 19, E. N.-R.

N. Y., New York—Apr. 16, by Dpt. Hospitals, S. S. Goldwater, comr., 125 Worth St., general contract, steam plant, electrical work and plumbing for altering and constructing additions to power house, Sea View Hospital, Richmond Boro. $293,761. Walker & Gillette, 599 Madison Ave., archts.

N. Y., New York—See "Contracts Awarded."

N. Y., Rochester—See "Contracts Awarded."

N. Y., Rushford—Apr. 20, by Central School Dist., Rushford, general contract, incl. heating, plumbing, electrical work, etc., for school. $160,000. P.W.A. project. Bley & Lyman, 505 Delaware Ave., Buffalo, archts. Noted Dec. 2, C. D.—Dec. 5, E. N.-R., under "Contracts Awarded."

N. Y., Syracuse—Dpt. Agriculture & Markets, State Office Bldg., Albany, taking bids constructing women's building addition, State Fairgrounds. W. E. Haugaard, State Bldg., Albany, archt. T. F. Farrell, State Office Bldg., Albany, engr. Noted Feb. 24, C. D.—Feb. 27, E. N.-R.

N. Y., Theresa—Union Free School Dist. 1, bids about May 1, constructing school. $163,-685. P.W.A. project. D. K. Sargent, 212 Harrison St., Syracuse, archt. Noted Oct. 24, C. D.—Oct. 31, E. N.-R.

O., Maderia—Apr. 14, by Bd. Educ., C. M. Aiken, pres., revised plans 1 story, basement, 60x248 ft., brick, steel school. $150,000. P.W.A. project. Hunt & Allen, 914 Main St., Cincinnati, archts. Noted Jan. 15, C. D.—Jan. 23, E. N.-R.

Pa., Phila.—Apr. 22, by Bd. Public Educ., 21st St. at Parkway, general contract new vocational school, 9th and Mifflin Sts.; adv. E. N.-R., Apr. 9.

Tex., Fort Worth—Apr. 22, by Bd. Educ., c/o E. P. Williams, bus. mgr., 3 story, basement, 127x420 ft., brick, rein.-con., cut stone trimmed Polytechnic Senior High School. $445,-000. J. R. Pelich, 1103 Trinity Life Bldg., archt.

†**Tex., LaGrange**—May 1, by Treas. Dept. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $115,000.

Wis., Marshfield—Apr. 16, by Water & Light Comn., making changes to building, foundations, piping, miscellaneous equipment, cooling pond, etc. R. D. Thomas & Assoc., Minneapolis, Minn., engrs.

†**Wis., Prairie du Chien**—Apr. 30, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. $70,000.

B. C., New Westminster—Apr. 30, by Secretary, Dpt. P. Wks., Ottawa, Ont., constructing fisheries station, warehouse and shops, dwelling, storm drains, sewer and water services, roadway, floats, etc. $35,000. K. M. Cameron, Ottawa, Ont., engr.

†*Federal Government.*

LOW BIDDERS

★ †**Ill., Chicago** — P. Wks. Administration, Housing Div., Wash., D. C., Mar. 31, constructing superstructures for Jane Adams Housing Project H-1405, from S. N. Nielsen Co., 3059 Augusta St., Chicago, $1,349,000. Noted Mar. 3, C. D.—Mar. 5, E. N.-R.

★ †**Tex., Fort Worth**—Treas. Dpt. at office Sup. Archt., Wash., D. C., Mar. 31, constructing narcotic farm buildings, etc., from Ring Constr. Co., 1645 Henn St., Minneapolis, Minn., Items (1) $2,334,000, (2) $2,365,000, (3) $2,527,000, (4) $2,648,300, (5) $2,672,-500, (6) $2,737,500, (7) $2,775,550 (8) $2,-792,500, (9) $2,824,500, (10) $2,838,500*** elevators, from Otis Elevator Co., 11th Ave. and 26th St., New York, N. Y., $18,335. Noted Mar. 20, C. D.—Mar. 12, E. N.-R.

CONTRACTS AWARDED

Calif., La Mesa—Grossmont School Dist., La Mesa, constructing manual arts building, to Hunt & Curry, Bancroft Bldg., San Diego. **P.W.A.** Noted Mar. 9, C. D.

Calif., Lomita—Los Angeles Bd. Educ., Chamber of Commerce Bldg., Los Angeles, 1 and 2 story high school, incl. classroom building and boys' physical education building at Nathaniel Narbonne High School, 254'23 Redondo-Wilmington Blvd., to Geo. M. Easton, 4822 South Jefferson Blvd., Los Angeles, $146,800. Noted Mar. 12, C. D.—Feb. 27, E. N.-R.

Faster News Service

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†**Calif., Redding**—Dinwiddie Constr. Co., general contractors, Crocker Bldg., San Francisco, reinforcing steel for U. S. Post Office, for Treas. Dpt. at office Sup. Archt., Wash., D. C., to Pacific Coast Steel Co., 20th and Illinois Sts., San Francisco***limestone, to California Cut Stone Co., South San Francisco***mill work, to Lannom Bros., 5th and Magnolia Sts., Oakland***marble, to Eisele & Dondero, 2895 3rd St., San Francisco***plumbing and heating, to Scott Co., 243 Minna St., San Francisco***electrical work, to American Electric Co., 462 Bryant St., San Francisco***structural steel, to Judson Pacific Co., Atlas Bldg., San Francisco. Noted Jan. 3, C. D.—Jan. 9, E. N.-R.

★ **Calif., Sacramento**—State, Division of Architecture, P. Wks. Bldg., general contract 4 story, rein.-con. offices for P. Wks., Division of State, South N St., to Azevedo Constr. Co., 920 "O" St., $379,995***electrical work, to Coast Electric Co., 2350 Cedar Ave., Long Beach, $40,167***heating and air conditioning, to Luppen & Hawley, 3126 "J" St., $87,237 ***plumbing, to Hately & Hately, 1710 10th St., $22,777***elevators, to Westinghouse Electric Elevator Co., 1 Montgomery St., San Francisco, $37,905. Grand total $568,081. Est. $500,000. Bids Mar. 24, awarded Mar. 27. Noted Apr. 2, C. D.

Calif., Salinas—Barrett & Hilp, general contractors, 918 Harrison St., San Francisco, concrete work for 3 story, rein.-con. court house, for Supervs., Monterey Co., to Central Supply Co., Watsonville; excavation to Gunite Constr. Co., Watsonville. **P.W.A.** Noted Feb. 25, C. D. —Feb. 27, E. N.-R., under "Contracts Awarded."

★ **Calif., San Diego**—City and San Diego Co., 2 to 5 story, basement, 240x546 ft., H-shaped, rein.-con., steel joint city and county building, 1,600 steel piles, forces account. $1,-300,000. City furnishes $50,000, County $50,-000 and W.P.A. $1,200,000. Noted Nov. 13, C. D.—Nov. 21, E. N.-R.

Calif., San Francisco—City and San Francisco Co., electrical work only for 3 story, rein.-con. machine shop at George Washington School, 30th Ave. and Balboa St., to Lynn & Heffernan, 114 Ashton Ave., $8,396. Bids Mar. 18, awarded Mar. 26. Noted Mar. 25, C. D.—Oct. 24, E. N.-R.

Calif., San Francisco—Lindgren & Swinerton, general contractors, 225 Bush St., masonry contract for 3 story administration building, to White & Gloor, Monadnock Bldg., for City and San Francisco Co. **P.W.A.** Noted Jan. 29, C. D. —Feb. 6, E. N.-R., under "Contracts Awarded."

Conn., Bridgeport—City, J. McLevy, mayor, City Hall, reinforcing steel for 3 story, 35x90 ft., brick, steel Englewood Hospital addition, to Truscon Steel Co., 42 Church St., New Haven ***millwork, to Schwarz Bros. Co., 62 River St.***brick, to I. L. Stiles & Son Brick Co., North Haven. Noted Dec. 17, C. D.—Dec. 26, E. N.-R., under "Contracts Awarded."

Conn., East Haven (br. New Haven)—Fusco-Amatruda Co., general contractors, 59 Amity Rd., New Haven, steel sash for brick, steel high school, Tyler and Taylor Sts., to J. S. Thorn Co., 40 Wall St., for Town, J. H. Cornell chn. Building Comn.***dampproofing, to Western Waterproofing Co., 82 West Dedham St., Boston, Mass.***granite, to Providence Granite Co., 210 Kinsley Ave., Providence, R. I.*** metal trim, to A. R. Kirschner Co., 30 Whitney Ave.***reinforced steel, structural steel and erection, to Topper & Griggs, 200 North Main St., West Hartford***iron, to National Steel Products Co., 3250 Main St., Hartford***metal doors, steel bucks, to Aetna Steel Products Corp., 101 Richardson St., Brooklyn, N. Y. Noted Feb. 24, C. D.—Feb. 27, E. N.-R., under "Contracts Awarded."

Conn., Guilford—E. and F. Constr. Co., general contractors, 94 Wells St., Bridgeport, painting for brick, steel high school, to David H. McKenzie, Inc., 391 Lincoln Ave., Bridgeport, for Town, School Bd., Guilford. Noted Feb. 13, C. D.—Feb. 20, E. N.-R., under "Contracts Awarded."

Conn., Seymour—H. Wales Lines Co., general contractors, 134 State St., Meriden, roofing for brick, stone town hall, to Shelton Roofing Co., 6 Bank St., Ansonia, for Town, Bd. Selectmen, Town Hall***reinforced structural steel and erection, to Connecticut Steel Erecting Co., 1043 State St., New Haven***metal partitions, to A. R. Kirschner, 30 Whitney Ave., New Haven ***excavating, to Seymour Sand & Gravel Co., Seymour***painting, to Crowley Bros., 85 Black Rock Ave., New Britain. Noted Mar. 4, C. D. —Mar. 12, E. N.-R., under "Contracts Awarded."

†**Conn., Thompsonville**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to T. F. Moran & Sons, 4 Welton St., Waterbury, $48,752. Bids Jan. 31. Noted Feb. 5, C. D.—Jan. 16, E. N.-R.

Conn., Torrington—City, City Clerk, City Hall, 3 story, 100x155 ft., brick, stone, steel town hall unit, to Buzzi & Sons, 586 South Main St., $210,000. Bids Mar. 20, awarded Mar. 25. Noted Mar. 9, C. D.—Mar. 12, E. N.-R.

★ **Fla., Tallahassee**—Bd. Educ. Leon Co., c/o M. L. Elliott, archt., 415 Tampa St., Tampa, constructing high school, to T. A. Monk, Bradenton. Est. $400,000.

Ind., Kouts—Pleasant Twp., A. Honehouse, trustee, general contract constructing 2 story, basement, 97x123 ft. high school, to J. I. Barnes, Culver, $158,000. Bids Feb. 29, awarded Mar. 27. Noted Mar. 17, C. D. — Feb. 20, E. N.-R.

Mass., Lee—Town, Bd. Selectmen, Town Hall, J. J. Bossidy, chn. Building Comn., Town Hall, general contract 2 story, basement, 60x132 ft. and 61x98 ft., high school addition, to E. W. Larkin Co., 1242 Main St., Springfield, $86,900 ***heating and ventilating, to Holyoke Valve & Hydrant Co., 150 Race St., Holyoke, $15,232*** plumbing, to T. J. Conway Co., 77 Winter St., Springfield, $5,189***electrical work, to Springfield Electric Co., 514 Taylor St., Springfield, $4,187. Grand total $111,508. Bids Mar. 25, awarded Mar. 30. Noted Apr. 2, C. D.—Mar. 5, E. N.-R.

Mass., Medford—M. S. Kelliher Co., general contractors, 38 Chauncy St., Boston, concrete piles for 3 story, basement city office building, to Raymond Concrete Pile Co., 31 St. James Ave., Boston, for City, Mayor's Office. Noted Mar. 26, C. D.—Feb. 27, E. N.-R., under "Contracts Awarded."

Mass., Shelburne Falls—Town, W. P. Rickett, chn. Bd. Selectmen, Town Hall, W. H. Buker, 1 story, basement, 65x100 ft., brick, steel manual training shops and school gymnasium, to Thomas J. Gass Co., 124 High St., Greenfield, $42,403. Bids Dec. 3. Noted Dec. 17, C. D.—Nov. 28, E. N.-R.

Neb., Potter—City, furnishing, installing improvements to switchboard in power plant, to A. E. Irwin, Kimball, $1,808. Est. $2,000. **P.W.A.** Bids Feb. 10. D. C. Shea, Potter, engr.

★ **N. J., Elizabeth**—Bd. Educ., Battin High School, South and South Broad Sts., general contract vocational school, 4th Ward, to Fatzler Co., Inc., 11 Hill St., Newark, $240,550 ***steel and iron, to Selbach-Meyer Co., 601 22nd St., West New York, $39,378***heating and ventilating, to F. S. Farrell, 249 Camden St., Newark, $52,294***plumbing, to A. Arace & Sons, 642 3rd Ave., $22,723***electrical work, to Buhl & Caffrey, Inc., 35 Hudson St., Newark, $38,900. Grand total $393,845. **P.W.A.** Noted Jan. 28, C. D.—Jan. 30, E. N.-R.

N. Y., Berlin—Bd. Educ., Central School Dist., general contract school, to Rathgeb Walsh, Inc., Portchester, $150,767***heating, to Hameline Co., Inc., 529 West Oriskany St., Utica*** plumbing, to Cohn & Kramer, Inc., 48 Grand St., Albany***electrical work, to Devoe Electric Co., 93 4th St., Troy. Subject to **P.W.A.** approval. Est. $198,000. Noted Mar. 17, C. D. —Mar. 19, E. N.-R.

N. Y., Grand Island — Sycamore Lumber & Mill Co., general contractors, 35 Lathrop St., Buffalo, constructing metal lathing and plastering for school, for Bd. Educ., to G. E. Hudson

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Public Buildings (Continued)

Plastering Co., 605 East Ferry St., Buffalo; painting, to C. M. Sellig & Sons, 1563 Jefferson Ave., Buffalo. **P.W.A.** Noted Jan. 22, C. D.—Jan. 30, E. N.-R.

N. Y., Hogansburg—State Bd. Educ., State office Bldg., Albany, testing work for Indian School, to E. W. Tompkins Co., 22 Market St., Albany, $5,638. Bids Feb. 6. Noted Feb. 4, C. D.

N. Y., Lima—Union Free School Dist. 9, general contract school, Rochester St., to Ifland & Rogers, 30 Alexander St., Rochester, $77,224. **P.W.A.** Bids Mar. 20. Noted Mar. 27, C. D. —Mar. 12, E. N.-R.

N. Y., Lockport—Wright & Kremers, Inc., general contractors, Pine Ave. and Main St., Niagara Falls, structural steel for library, for Bd. Trustees Lockport Library, City Hall, to Dobbie Fdry. & Machine Co., Portage Rd. Noted Jan. 28, C. D.—Jan. 30, E. N.-R., under "Contracts Awarded."

N. Y., Marcellus—Central School Dist. 1, general contract school, to Bedford Constr. Co., 1300 Broad St., Utica. $411,051. **P.W.A.**

N. Y., Merrick—W. Kennedy Constr. Co., general contractors, 125 Montague St., Brooklyn, awarded contract for reinforcing steel, for school for Bd. Educ., to J. Ryerson & Sons, 293 Wside Ave., Jersey City, N. J., 550 tons structural, to Lehigh Structural Steel Co., Allentown, Pa. Noted Dec. 19, C. D. General contractor soon lets other separate contracts.

N. Y., New York—Dpt. Parks, Arsenal Bldg., Central Park, New York, constructing 1 story, brick garage and service building, Bway. and Bennett Aves., Fort Tryon Park, day labor, $38,000. A. Embury, 2nd, c/o owner, archt. Owner is purchasing material.

N. Y., Olmstedville—Central School Dist. 1, general contract school, to Brown & Hand, 108 Dorothy St., Syracuse***plumbing and heating, to Levi Case & Co., 412 Warren St., Schenectady***electrical work, to Charles Sheridan, 10 Elm St., Cortland. **P.W.A.** Bids Jan. 31. Noted Feb. 7, C. D.

N. Y., Rochester—Div. Military & Naval Affairs, Capitol Bldg., Albany, constructing new floor in State Armory, relief labor, $50,000. **W.P.A.** F. H. Carroll, chf. engr., A. Hackett, 1460 South Ave., procurement officer W.P.A., will purchase materials.

N. Y., St. Albans—Dover Constr. Co., general contractors, 53 Greene St., New York, 225 tons structural steel for P. S. 136, for Bd. Educ., 500 Park Ave., New York, to Weatherly Steel Co., Weatherly, Pa. Noted Jan. 21, C. D.—Jan. 23, E. N.-R.

†N. Y., Spring Valley—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to Chester Constr. Co., 341 East 30th St., New York, $49,425. Bids Jan. 7. Noted Jan. 13, C. D.—Dec. 26, E. N.-R.

N. Y., Yonkers—Bd. Educ., City Hall, electrical work for Beech Hill-Argemont School, to Palisade Electrical Co., 6 Wells Ave., Yonkers, $8,968; oil burner for Roosevelt High School, to Thermal Equipment Co., Mount Vernon, $6,955. **P.W.A.** Bids Jan. 21. Noted Jan. 17, C. D.

N. C., Raleigh—State Hy. & P. Wks., W. L. Craven, engr., plumbing at Central Prison Unit 7, to Bieman & Rowell, 401 West Martin St., $21,400. Bids Mar. 30. Noted Mar. 30, C. D.

N. D., Grafton—Bd. Administration, E. G. Wattner, secy., Bismarck, general contract 3 story, basement, 182x201 ft. dormitory, at State School, to R. J. McLeod & Co., 412 Builders Exchange Bldg., Duluth, Minn., $159,540*** plumbing and heating, to R. L. Anderson, 519 Cleveland Ave. N., St. Paul, Minn., $28,942*** wiring, to Central Service Co., 321 N. P. Ave., Fargo, $4,770. Grand total $193,252. **P.W.A.** Bids Mar. 23. Noted Mar. 5, C. D.—Mar. 12, E. N.-R.

O., Ironton—Lawrence Co., H. W. Mountain, chn., plumbing for 3 story, basement, 142x160 ft., brick, concrete hospital, South 9th St., to J. F. Stephens, Portsmouth, $17,284***insulation and pipe covering, to Johns-Manville Co., American Bldg., Cincinnati, $4,194***electrical work, to A. D. George Electric Co., 1002 South 3rd St., $11,375***heating and ventilating, to J. F. Stevens, Portsmouth, $22,500***elevator and dumbwaiter, to Shepard Electric Co., 2425 Colerain Ave., Cincinnati, $16,000. Grand total $71,353. **P.W.A.** Noted Mar. 17, C. D.—Mar. 19, E. N.-R.

†Pa., Coatesville—Vet. Bu., Arlington Bldg., Wash., D. C., electrical passenger elevator in Veterans Facilities, to Atlantic Elevator Co., D St. and Erie Ave., Phila., $15,104. Noted Mar. 6, C. D.—Jan. 30, E. N.-R.

R. I., Howard (Cranston)—New England Concrete Co., general contractors, 381 Promenade St., Providence, excavation for male ward building, State Hospital, to Ricci & Ricci Excav. Co., 207 Roosevelt St., Providence, for State of Emergency P. Wks. Comn***reinforcing steel, to Bethlehem Steel Co., 75 Federal St., Boston***structural steel, to Bethlehem Fabricators, Inc., 9 Melcher St., Boston***marble, to Capitol Marble & Tile Co., Inc., 48 Oxford St., Providence***painting, to Scully-McDonnell & Co., Inc., 71 Tyndall Ave., Providence. Noted Mar. 19, C. D.—Mar. 26, E. N.-R., under "Contracts Awarded."

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R. I., Howard (Cranston)—Matthew Cummings Co., general contractors, 43 Tremont St., Boston, granite for building for disturbed men and women, to Alexander Thomson, Inc., 3 Albany St., Cambridge, for State Emergency P. Wks. Comn., State House, Providence*** limestone, to Indian Hill Stone Co., Bloomington, Ind.***metal trim, to W. J. Grosvenor & Co., Inc., 270 Cedar St., Somerville***hardware, to Dudley Hardware Co., 124 Dorrance St., Providence***vitrolite tile, to James Dunning & Sons, Inc., 380 South Water St., Providence. Noted Feb. 28, C. D.—Mar. 5, E. N.-R., under "Contracts Awarded."

†Tenn., Memphis—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Marine Hospital Buildings 1, 2 and 3, to J. A. Bass Co., 332 Sexton Bldg., Minneapolis, Minn., $393,355. Bids Mar. 17. Noted Mar. 20, C. D.—Feb. 20, E. N.-R.

Tenn., Nashville—State and P.W.A. at office of Governor Hill McAllister, State Capitol Bldg., 3 story, basement, attic, Tennessee Marble, supreme court building, plain found., to Rock City Constr. Co., 135 4th Ave. N., $472,753. **P.W.A.** Bids Mar. 24, awarded Mar. 24. Noted Mar. 30, C. D.—Mar. 1, E. N.-R.

Tenn., Winchester—J. B. Templeton, at office County Court Franklin Co., 3 story, Bedford limestone courthouse, to N. Yearwood, Woodlawn Dr., Nashville, $151,000. Noted Mar. 16, C. D.—Mar. 19, E. N.-R.

Tex., Beaumont—City, R. Edmonds, secy., furnishing, installing air conditioning system in city hall, to Dixie Plumbing Co., Houston, $34,800. Est. $60,000. **P.W.A.** Noted Mar. 6, C. D.

Tex., Burnet—Burnet Co., c/o O. B. Zimmerman, judge, constructing 3 story, fireproof courthouse, to Banspach Bros., 245 West Josephine St., San Antonio, $77,129***granite, to Texas Pink Granite Co., Marble Falls, $18,000 ***courtroom furnishings, to Fisher Co., Charles City, Ia., $5,730***heating, to Jud & Ormand, 703 North Flores St., San Antonio, $4,934***plumbing, to Young & Pratt, Austin, $4,000***electrical work, to Burnet Radio & Electric Shop, Burnet, $2,372. Grand total $112,165. **P.W.A.** Bids Mar. 20, awarded Mar. 27. Noted Apr. 2, C. D.—July 18, E. N.-R.

Tex., Canton—Van Zandt Co., E. C. Stovall, judge, general contract 4 story, basement, 70x116 ft., limestone, rein.-con. court house, to L. W. Wentzel, Sherman, $125,300***plumbing and heating, to L. O. Layton, Tyler, $14,725***wiring, to Petroleum Electric Co., Kilgore, $2,535. Grand total $142,570. **P.W.A.** Bids Jan. 24, awarded Mar. 26. Noted Feb. 13, C. D.

Utah, Ogden—Weber Co. School Bd., constructing grade schools at Riverdale and South Weber, to Champion Co., Ogden, $59,645. Bids Mar. 28, awarded Mar. 31. **P.W.A.** Part of $285,000 P.W.A. school building program, E. F. Piers, Ogden, archt. Noted Mar. 20, C. D.

COMMERCIAL BUILDINGS

PROPOSED WORK

Calif., Burlingame—San Francisco Bank, 526 California St., San Francisco, sketches by W. D. Peugh, 333 Montgomery St., San Francisco, rein.-con. bank, store and office building, $150,000.

Mass., Boston—I. Richmond, archt., 248 Boylston St., soon lets contract 3 story, basement, 35x105 ft., brick, steel, stone office and warehouse, concrete found., Commonwealth Ave., for S. R. Levine, c/o architect. Est. about $140,000.

Mich., Dearborn—Ford Motor Co., soon lets contract constructing 2 story, basement, brick, steel, stone recreation building at Greenfield Village, $150,000. Derrick & Gambler, Union Guardian Bldg., Detroit, archts. Noted Sept. 5, C. D.—Sept. 12, E. N.-R.

Minn., Minneapolis—Dayton Co., A. C. White, genl. supt., 700-32 Nicollet Ave., plans air conditioning system for department store, incl. central conditioning unit, ducts, pumps, etc. $150,000. W. K. Robertson, 4321 Fremont Ave. S., engr.

N. J., East Orange—Twenty-Nine South Munn Ave. Corp., c/o H. Ginsbern, archt., 205 East 42nd St., New York, 4 story, 102x228 ft. apartment, South Munn Ave. and Chestnut St. $140,000 or more.

N. J., West Orange—Corp., c/o G. N. Swelt, Maplewood, plans tract development and brick dwellings on 5 acre site, Gregory Ave. and Northfield Rd. To exceed $140,000. Site acquired.

N. Y., Bayside—Oakland Realty Co., 217 St. and 54th Ave., plans by W. Sanbur, 162-02 Jamaica Ave., Jamaica, constructing group frame dwellings, 53rd Ave. and 217th St. $140,000.

N. Y., Brooklyn—Adrian Van Sinderen, 40 Remsen St., sketches by C. Clark, c/o owners, altering heating, plumbing, elevator in two 6 story apartments, 419 Hicks St. $60,000.

N. Y., Brooklyn—Eastboro Development Co., 1334 48th St., plans by S. Gardstein, 50 Court St., constructing 6 story, brick apartment, plain found., 6224 22nd Ave. $140,000.

N. Y., Brooklyn—Manmark Realty Corp., 71 Pineapple St., plans by J. Lubroth, 26 Court St., altering plumbing, heating in apartment, 71 Pineapple St. $37,000 with fixtures.

N. Y., Brooklyn—Park Home Builders, 66 Court St., sketches by B. Godseter, Jr., owner, constructing group 2 story, brick dwellings, Stuart St. and Avenue S. $150,000.

N. Y., Buffalo—Williams Hengerer Co., Main St., Buffalo, and Associated Dry Goods Co., 4 West 35th St., New York, plans alterations, improving and modernizing department store, incl. air conditioning. To exceed $100,000.

N. Y., Elmhurst—Elbertson Realty Corp., Beach 131st St., Belle Harbor, plans by M. Rothstein & Son, c/o owner, construction, story, brick apartment, Whitney Ave. and Elbertson St. $140,000.

N. Y., Flushing—Butkereit Homes, 58th Ave. and New Main St., plans constructing (unit), group brick dwellings, 58th Ave., New Main St. $140,000.

N. Y., Forest Hills—Oran Realty Corp., 9 Junction Blvd., Corona, plans by A. E. A. Garden City, group 2 story, frame dwellings, Everton St. and 63rd Dr. $140,000.

N. Y., Flushing—Queensland Holding, 41-19 63rd St., Woodside, plans constructing group brick dwellings on 68 lots, 167th St. to 46th Ave. To exceed $140,000. Site acquired. Architect not appointed.

★ **N. Y., New Gardens**—East New York Savings Bank, Atlantic and Pennsylvania Aves., Brooklyn, bids in September or later, constructing 6 story, apartment Metropolitan Ave. and Park Lane. $750,000. B. Braunstein, 162-18 Jamaica Ave., Jamaica, archt.

N. Y., New York—Four Hundred Twenty-Eight Eighth Avenue Corp., c/o United Cigar Stores Delware Corp., 330 West 42nd St., plans constructing store, 42nd St. and 8th Ave. Est. about $140,000. Site acquired. Architect not appointed.

N. Y., New York—Milton R. Leader, 90 East 164th St., plans 6 story, 75x204 ft. store and apartment, 167th St. near Sheridan Ave. To exceed $200,000. Site acquired.

N. Y., New York—Mutual Life Insurance Co., 34 Nassau St., plans 2 story, stores and show rooms, Bway. and 55th St. $150,000 or more. Architect not appointed. Demolition buildings on site, to A. A. Volk, 1819 Bway.

N. Y., New York—St. Morris Apartments, Inc., 106 Fort Washington Ave., altering heating, plumbing in two 7 story stores and apartments, 1934 Madison Ave., separate contracts awarded. $70,000. H. I. Feldman, 15 West 44th St., archt.

N. Y., Rockville Center—Shannon-Bailey Co., Purdy Courts, plans constructing group brick dwellings, Purdy Terrace. $140,000. Private plans.

N. Y., Rockville Center—Canterbury Realty Corp., Roxon Rd., plans constructing group brick dwellings, Roxon Rd. $140,000.

★ **O., Cleveland**—Farmer Apartments, c/o G. Y. Farmer, 1137 Cook Ave., Lakewood, plans by Steffens & Fox, 1940 East 6th St., 10 story, basement, brick, steel apartment, Edgewater Dr. $1,000,000.

O., Cleveland—G. Gall, 14509 Milverton Rd., plans by Fox & Duthie, 1935 Union Trust Bldg., 4 story, basement, brick, steel apartment, $200,000.

Pa., Erie—St. Mary's Parish plans by G. W. Stickle, 228 Commerce Bldg., and takes bids in April, 2 story, basement, 90x145 ft. fireproof recreational center, 10th St., also connecting passage to St. Mary's School adjoining.

Tenn., Memphis—Manager of Peabody Hotel soon lets contract installing air conditioning system in Peabody Hotel. Est. $40,000. L. Weill & W. Moses, 427 South Peters St., New Orleans, La., engrs.

Tex., Amarillo—J. Ray, plans by Rittenberry & Garder, 1012 Fisk Bldg., 2 story found. for 4 story brick, structural steel building, concrete pile found., 8th and Polk Sts. $150,000.

Tex., Beaumont—Hotel Beaumont plans reconditioning elevators, lighting, etc., and alterations in hotel. $140,000.

Tex., Harlingen—Lower Rio Grande Valley Mid-Winter Fair, A. L. Brooks, mgr., sketches display buildings and other improvements for mid-winter fair, incl. livestock, dairy, poultry and general display buildings, enlarging grandstand, building racing track, building paddock, general and commercial booths, large facilities for auto and farm machinery displays.

Ont., Haileybury—Sisters of Misericorde, Haileybury and Montreal, Que., plans by head office in Montreal, Que., constructing addition to present hospital. $150,000.

Ont., Toronto—George & Moorhouse, archts., 1123 Bay St., soon lets contract constructing 2 story, basement, brick suburban residence, plain found., incl. golf course, polo ground, etc., Woodbine Ave., near Don Mills Rd., for H. R. Bain, c/o architects. To exceed $200,000.

Que., Quebec City—Roman Catholic School Comn. of Quebec, A. C. Taschereau, secy., 72 St. Ursule St., plans by R. Chenevert, 50 Cote du Palais, constructing school, Champfleury St. $160,000.

BIDS ASKED

Calif., Chico—C. Cole, Chico, archt., taking bids 1 story, 40x245 ft., rein.-con. hospital, The Esplanade, for Dr. N. T. Enloe, Chico; W. Adrian, 497 Market St., San Francisco, engr; A. Coddington, 222 Kearny St., San Francisco, mechanical engr.

†Federal Government

Commercial Buildings (Continued)

N. Y., Freeport—See "Contracts Awarded."

N. Y., Jamaica—See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

N. Y., Perry—Apr. 15, by P. M. Halsken & L. T. Strong, archts., 505 Savings Bank Bldg., Lima, O., constructing theatre, for Schine Chain Theatre, Gloversville. Noted Nov. 13, C. D.—Nov. 21, E. N.-R.

N. Y., St. Albans—See "Contracts Awarded."

O., Cleveland—I. Koslen, 1727 Cumberland Rd., taking bids 4 story, basement, 55x130 ft., brick, steel apartment building, Euclid Heights Blvd. $200,000. M. Weis, 750 Prospect Ave., archt.

Pa., Pittsburgh—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Long Beach—I. E. Loveless, archt., 102 South Robertson Blvd., Beverly Hills, electrical work for 4 story hospital, for Sisters of Charity of the Incarnate Work, to Globe Electric Wks., 15th and Mission Sts., San Francisco, $20,295. Noted Feb. 13, C. D.—Feb. 20, E. N.-R., under "Contracts Awarded."

Ill., Chicago—Wrigley Co., 410 North Michigan Ave., air conditioning commercial building, to Kroeschell Boiler Co., 3253 North Kedzie Ave. Est. $225,000

Mass., Quincy—J. M. and C. J. Buckley Co., general contractors, 120 Tremont St., Boston, heating for office building, East Howard St., to J. G. Lamotte & Sons, Inc., 143 Federal St., Boston, for Bethlehem Ship Building Corp., East Howard St.***plumbing, to Wm. H. Mitchell & Co., 90 Arch St., Boston***millwork and wood sash, to Laing Bros., 55 Hayward St., Braintree***steel sash, to Truscon Steel Co., 38 Chauncy St., Boston***electrical work, to Charles L. Devoe Co., Inc., 60 South St., Boston***reinforcing steel and door bucks, to Kalman Steel Co., 75 Federal St., Boston***shoring, to Soley & Blair, Inc., 234 Maple St., Chelsea***structural steel and miscellaneous iron, by owners. Noted Mar. 24, C. D.—Mar. 26, E. N.-R., under "Contracts Awarded."

Mo., Cape Girardeau—**Berberich Hotels, Inc.**, W. Berberich, pres., 1734 Washington Ave., St. Louis, general contract 5 story, basement, 37x41 ft., rein.-con., brick, terra cotta, steel addition to Marquette Hotel, Bway. and Fountain St., to Gerhardt Constr. Co., 530 Bway. Bids Mar. 28. Noted Mar. 23, C. D.—Mar. 26, E. N.-R.

N. J., Tenafly—Homes of Tomorrow, constructing group twenty-five 2 story, frame dwellings, separate contracts now being awarded on first unit. Plans additional units later, $140,000 or more. Shampan & Shampan, 26 Court St., Brooklyn, N. Y., archts. Noted Nov. 21, C. D.—Nov. 28, E. N.-R.

N. Y., Freeport—L. Land Corp., Little Neck, group brick dwellings, Meadowbrook Parkway, separate contracts. To exceed $140,000. Noted Mar. 4, C. D.—Mar. 12, E. N.-R.

N. Y., Jamaica—Moss Bros., Rockaway Blvd. and 147th St., constructing brick, stone dwellings, Miller Nurseries tract and 147th St., day labor and separate contracts. To exceed $400,000.

N. Y., Mineola—J. Farber, Jericho Turnpike and Foch Blvd., Mineola, constructing group brick dwellings, Jericho Turnpike, day labor and separate contracts. $140,000. Private plans. Noted Oct. 25, C. D.—Oct. 31, E. N.-R.

N. Y., New York—Forty-Six East 78th Street Corp., c/o S. Minskoff, pres., 521 5th Ave., demolition buildings on site for 11 story apartment, 46-50 East 78th St., to S. Kaufman Demolition Co., c/o owner. Owner awarding separate contracts. Est. $150,000. Boak & Paris, 101 Park Ave., archts. Noted Feb. 26, C. D.—Mar. 5, E. N.-R.

N. Y., New York—International Mercantile Marine, 1 Bway., altering heating, plumbing in 12 story office building, 1-5 Greenwich St., separate contracts, $40,000. P. H. Gabel, c/o owner, archt. Noted Mar. 4, C. D.—Mar. 12, E. N.-R.

N. Y., New York—One Thousand Six Hundred and Two 2nd Avenue Holding Corp., 3030 Arlington Ave., altering heating, plumbing in apartment and store, 1602 2nd Ave., separate contracts now being awarded. $38,000. J. Schafrm, 441 East Tremont Ave., archt. Noted Feb. 26, C. D.—Mar. 5, E. N.-R.

N. Y., New York — Seventy-Seven Cooper Street Corp., L. A. Minskoff, pres., 521 5th Ave., 6 story, brick apartment, 628 West 207th St., and 77 Cooper St., separate contracts to be awarded soon. $140,000. Boak & Paris, 101 Park Ave., archt. Noted Feb. 26, C. D.—Mar. 5, E. N.-R.

N. Y., New York—See "Proposed Work."

N. Y., Rochester—National Clothing Co., 159 East Main St., air conditioning system for store, to Carrier Eng. Corp., 14 Franklin St., about $38,000. Gustke & Pioch, 130 East Main St., engr.

N. Y., St. Albans—Warranty Building Corp., 232nd St. and Foch Blvd., constructing group 1 story, frame dwellings, 231st St. and Foch Blvd., separate contracts. $140,000. Private plans.

N. Y., Syracuse—Owner, c/o Eagan Realty Co., 212 Harrison St., remodeling Gridley Building, South Salina St., to Burns Constr. Co., 601 East Jefferson St. General contractor awarded contract for painting, to Long & Shimbecker, 112 Hutchison Ave.***structural steel, to Syracuse Eng. Co., Everson Bldg.***metal lathing and plastering, to F. H. Schneider Plastering Co., West Belden Ave., United States Fidelity & Guaranty Co., Calvert and Redwood Sts., Baltimore, Md., lessee. Noted Mar. 31, C. D.—Apr. 9, E. N.-R.

N. Y., Syracuse—Gorsline & Swane, general contractors, 96 Pearl St., Rochester, reinforcing steel for car facility building, Burnet Ave. for New York Central R.R. Co., J. W. Pfau, ch. engr., 466 Lexington Ave., New York, to Brewster & Williams, Inc., Dillaye Bldg., Syracuse***fabricating steel, to Concrete Steel Co., 207 James St. Noted Mar. 26, C. D.—Apr. 2, E. N.-R., under "Contracts Awarded."

O., Cleveland—Great Lakes Exposition Co., switchgear equipment and power plant for exhibition grounds for Great Lakes Fair Grounds, to General Electric Co., Nela Park, Cleveland. Est. $50,000. Noted Feb. 5, C. D.—Feb. 13, E. N.-R.

O., Cleveland—Great Lakes Exposition, Terminal Tower, constructing group international villages known as "Streets of the World," incl. shops, stores, cafes and cottages, around international square, to Hunkin Conkey Co., 170 East 12th St., est. $70,000; also 72 ft. proscenium arch symphony shell on Sherwin Williams Plaza, to accommodate 100 musicians, to J. L. McCune Co.; and 16 golden eagles, 16 ft. each, designed by Walker & Weeks, 2341 Carnegie Ave., to Fischer-Jirouch Co., 7871 Superior Ave.

O., Cleveland—Cleveland Hotel Co., c/o R. Sharp, Terminal Tower, constructing new air condition system cocktail bar, dining room, for hotel, Public Square, to J. Gill & Son, Bulkley Bldg. Est. $60,000. Awarded Mar. 24. Small, Smith & Reeb, Terminal Tower, archts.

Pa., Pittsburgh — Loews Penn Theatre, M. Cullen, mgr., 6th Ave., complete cleaning, painting, carpentry work, electrical work, new seating, glass, glazing, drapes, carpentry work in theatre, repairing after flood, to H. Dunn & Co., 1014 Locust St.; electrical work to J. Devlin, 206 Stanwix St. Est. $100,000.

Pa., Pittsburgh—Joseph Horne Co., Penn Ave., repairing first floor and basement of store after flood, general contract, to Mellon Stuart Co., Oliver Bldg.; equipment and fixtures, to C. H. Wheeler Co., Woolworth Bldg., New York. Est. $150,000. Janssen & Cocken, Century Bldg., archts.

Pa., Pittsburgh — Roosevelt Hotel, R. O. Shields, building supt., 6th and Pennsylvania Aves., altering and reconditioning after flood, entire basement, incl. coffee shop, and first floor, incl. restaurant lobby, involving redecorating, refurnishing, carpentry, electric, painting, floor covering, day labor, $100,000. Private plans.

R. I., Providence—J. Lisker, c/o D. Shapiro, archt., 58 Weybosset St., 3 story, basement, 60x200 ft., brick, steel, stone, hollow tile apartment, concrete found., to J. P. Flynn, 112 Lenox Ave., for Waterman St. Co., c/o architect. Est. about $140,000. Noted Feb. 21, C. D.—Feb. 27, E. N.-R.

Ont., Ottawa—H. Dagenais Ltd., general contractors, 225 St. Patrick St., boilers for 4 story, basement, brick, steel convent addition, for Order of Grey Nuns of the Cross, Water St., to Babcock Wilcox & Goldie-McCulloch Ltd., Galt***elevators, to Turnbull Elevator Co. Ltd., 78 Lewis St.***plumbing, fixtures and radiators, to Crane Ltd., 748 Bank St.***kitchen equipment, to Geo. R. Pouse Range Co. Ltd., 2025 University Ave., Montreal, Que.***laundry equipment, to Canadian Laundry Mchy. Co. Ltd., 47 Sterling Rd., Toronto. Noted Oct. 28, C. D.—Oct. 31, E. N.-R.

†Puerto Rico—P. Wks. Administration, Div. Housing, Dpt. Interior, Wash., D. C., constructing Caserio Mirapalmeras, Project H-3600 SJ-A, to S. Quinones, P. S. Box 1226, San Juan, Puerto Rico, $264,000. Bids Mar. 3. Noted Mar. 6, C. D.—Feb. 20, E. N.-R.

†T. H., Pearl Harbor—Yards & Docks, Navy Dpt., Wash., D. C., substation for repair basin Navy Yard, Spec. 8051, to Alta Electric & Mechanical Co., 467 O'Farrell St., San Francisco, Calif., $146,920 (300 days). Bids Mar. 25. Noted Mar. 30, C. D.—Mar. 19, E. N.-R.

INDUSTRIAL BUILDINGS

PROPOSED WORK

Calif., Oakland — WAREHOUSE — General Petroleum Co., 519 19th St., making plans 1 story, 30x80 ft. steel frame warehouse, Pier St. Private plans.

Calif., Richmond—PLANT—California Spray Chemical Co., c/o Stone & Webster, engrs., Russ Bldg., San Francisco, chemical spray plant, $100,000 or more.

★ **Calif., San Diego**—FACTORY—Consolidated Aircraft Corp., 3302 Pacific Blvd., soon lets contract aircraft factory, incl. 200x200 ft. x 40 ft. high experimental building, having 100x125 ft. x 50 ft. high warehouse wing, 97,300 sq.ft. floor space, 100x450 ft. x 14 ft. high factory addition, to be used for general manufacturing purposes, 75,000 sq.ft. floor space; 50x200 ft. tool and fixture building, 40x50 ft. x 14 ft. high paint and oil storage house, 40x50 ft. photographic, physical and chemical laboratory building, etc. $600,000. Edward Cray Taylor & Ellis Wing Taylor, 803 West 3rd St., Los Angeles, archts. and engrs. Noted Feb. 28, C. D.—Mar. 5, E. N.-R.

Calif., San Fernando—STORAGE—San Fernando Lemon Assn., South Brand Blvd., plans by R. C. Wilson, Say Rd., Santa Paula, 3 story 126x154 ft., rein.-con. lemon storage building Stanwood St. and Brand Blvd. $60,000.

Conn., Bridgeport—SALES and SERVICE STATION—C. Rickard & Sons, J. Rickard, vice-pres., Howard Ave., plans by C. Davis, 83 Fairfield Ave., brick, steel sales and service station Fairfield Ave., $50,000. International Harvester Co. of America, 320 North Ave., lessee. Noted Mar. 4, C. D.—Mar. 12, E. N.-R.

Ill., Chicago—FACTORY—Dale Valve Co., 1923 West Carroll St., soon lets contract 3 story basement, 80x123 ft., brick, plain found., 1938 West Carroll St. Ivar Viehmann, 3809 North Ridge Ave., engr.

Ill., Chicago—PLANT—Zenith Radio Corp., 3620 South Iron St., plans constructing plant. To exceed $40,000. Owner now acquiring site.

Ind., Austin — PACKING PLANT — Austin Packing Co., I. Mozan, pres., soon takes bids constructing 1 story, 100x200 ft. meat packing plant, $50,000. Owner taking bids now on materials. Private plans.

Ia., Shenandoah—POWER PLANT—Corporation c/o H. Bartles, Shenandoah, applied for franchise to construct Diesel electric power plant, $80,000.

Ky., Louisville — STORAGE — Merchants Wholesale Grocery Co., 1121 West Main St., will not rebuild storage and distribution plant destroyed by fire. To exceed $37,000. Company has leased former Kentucky Terminal Warehouse Co. plant and will occupy this instead. Noted Feb. 6, C. D.—Feb. 13, E. N.-R.

La., Shreveport—CRACKING UNIT—Shoreline Refining Co. plans installation cracking unit at Lewis, north of here, $200,000. Preliminary work started. Is contemplating construction 13 mi. pipe line from Rodessa to Lewis.

Me., Auburn—FACTORY—Heuston Foods Co., 180 Minott Ave., plans rebuilding 3 story, basement factory foundation and other damage caused by flood, Minott Ave. To exceed $37,000. Architect not appointed.

Md., Cumberland—PLANT—Cumberland Brewing Co., Cumberland, soon lets contract additions to various buildings. Shattuck & Layer, 221 North LaSalle St., Chicago, Ill., archts.

Mass., Springfield—FACTORY—Moore Drop Forging Co., 38 Water St., plans rebuilding factory, destroyed by fire and flood, Water St. $50,000. Architect not appointed. New machinery and equipment required.

Mich., Saginaw—AUTO FACTORY—General Motors Corp., Saginaw Steering Gear Corp., Saginaw, plans by Frantz & Spence, 118 North Washington Ave., 1 story, 60x120 ft., brick, rein.-con., steel factory, plain found., Clinton St. $40,000.

Mich., Wyandotte — FACTORY — All-Metal Products Co., Wyandotte, plans 1 story, 103x300 ft., brick, steel, rein.-con. factory, plain found. Est. $55,000. Private plans.

N. Y., Albany — PLANT — Armour & Co., Union Stock Yards, Ill., and 37 Spencer St., Albany, plans constructing 2 story plant addition, to be used as warehouse and garage, 37 Spencer St., $40,000; also plans later smokehouse. Private plans.

N. Y., Brooklyn—SERVICE GARAGE—J. P. Day, Inc., 67 Liberty St., New York, bids in June, general and separate contracts constructing 2 story, brick garage, 40 Brighton 11th St. $40,000. Lama Proskauer, 383 Jay St., archts. Noted Mar. 4, C. D.—Mar. 12, E. N.-R.

N. Y., Brooklyn—SCRAP METAL PLANT—Pananello & D'Aniello, 4623 2nd Ave., plans by C. A. Levitt, 2995 Bedford Ave., constructing brick scrap metal and junk plant extensions, 4623 2nd Ave. $37,000 with equipment.

N. Y., Brooklyn—FACTORY—Safe Breath Product Co., 863 Pacific St., plans altering factory, 863 Pacific St. $37,000 with equipment. Architect not appointed.

N. Y., Homer—MILL—Newton Woolen Mills, C. Miller, pres., plans rebuilding woolen mill, recently destroyed by fire. $40,000. Architect and engineer not appointed.

N. Y., Long Island City—FACTORY—American Brake Shoe & Fdry. Co., 230 Park Ave., New York, bids after July 15, constructing factory, Riverside Ave. and Long Island R.R. $150,000. W. A. Winters, c/o owner, engr. in charge. Noted Nov. 14, C. D.—Nov. 21, E. N.-R.

N. Y., New York—STORAGE, etc.—Nordray Realty Corp., 295 Lafayette Ave., plans by L. H. Friedland, c/o owner, constructing storage and showrooms, 2914 3rd Ave. $75,000.

N. Y., Rome—FACTORY—Rome Cable Co., Rome, plans altering and constructing factory additions. To exceed $40,000. **Maturity indefinite.** Architect not appointed.

O., Warren — FACTORY — General Motors Corp., General Motors Bldg., Detroit, Mich., soon takes bids expanding Packard Electric Plant, constructing new factory units increasing floor space 50,000 sq.ft., and remodeling another unit. $150,000. An addition of about $50,000 in new machinery and equipment. Private plans.

Pennsylvania, West Virginia, Connecticut, etc.—STORAGE PLANTS—Standard Oil Co. of

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†*Federal Government.*

Industrial Buildings (Continued)

N. J., 26 Broadway, New York, plans repairs and alterations to bulk oil storage plants in flood areas. $100,000. Private plans.

Pa., Williamsport — WAREHOUSE, etc. — Swift & Co., Chicago, Ill., and 4th and Hepburn Sts., Williamsport, H. Millington, mgr., plans modern branch warehouse and plant, also installing new packing plant machinery and equipment, on property acquired at Lycoming and Locust Sts. $150,000. **Maturity soon.**

R. I., Providence—WAREHOUSE, etc.—American Brass Co., 131 Dorrance St., Providence, plans by J. P. Geddes, 840 Hospital Trust Bldg., 1 story, brick steel warehouse and office, concrete found., 12,000 sq.ft. floor space, Chestnut and Elm Sts. To exceed $37,000.

Tex., Houston — WAREHOUSE — Universal Terminal Warehouse Co., c/o L. L. Schwecke, pres., 1006 Washington St. at S. P. Tracks, plans by Jonas & Tabor, Union Natl. Bank Bldg., 2 story 150x250 ft., brick, concrete, steel addition to present warehouse incl. elevator extensions, etc. Est. about $100,000.

Tex., Lubbock—GARAGE—G. P. Kuykendall, Lubbock, soon takes bids 1-2 story fireproof garage building, 25,000 sq.ft. floor space, plain found. Owner will install general motor repairing facilities on 2nd floor. $80,000. Private plans.

Tex., McAllen—PLANT—Riona Products Co., c/o L. Akin, 17 North 22nd St., soon takes bids 2 story, brick, rein.-con. canning plant, plain found., on site covering 10 city blocks. $150,000. Private plans.

Utah, Salt Lake City—WAREHOUSE, etc.—Purity Biscuit Co., 471 West 5th South St., sketches by W. E. Ware, Utah Savings & Trust Bldg., warehouse and office building, $100,000.

Wash., Aberdeen—PACKING PLANT—J. E. Linde plans sardine reduction and packing plant. $75,000. Site being sought.

★ **Alta., Fort McMurray**—PLANT—International Bitumen Co. Ltd., Edmonton, soon takes bids constructing plant to extract petroleum and other by-products from tar sands. $1,500,000. Noted Apr. 24, C. D.—May 2, E. N.-R., under "Alberta."

★ **B. C., Choate**—MILL—B. C. Nickel Mines Ltd., 510 West Hastings St., Vancouver, plans constructing 500 ton nickel concentrator power plant (water probably), tramway and townsite development. $1,500,000. **Maturity in fall.** C. D. Kaeding, M.E. Toronto, Ont., consult. metallurgist.

N. S., Glace Bay—POWER PLANT—John C. Nicholson, Dominion Coal Co. Ltd., Union St., prepares plans constructing new unit at Seaboard Power Plant. $250,000.

Man., Brandon—PLANT—Joseph Donaldson Ltd., making plans constructing packing and processing plant. $75,000.

Ont., Leaside—PLANT—Millwood Cleaners, Dyers & Storage Co. Ltd., W. Burke, mgr., plans steam electric and dry cleaning plant. $50,000.

BIDS ASKED

Ill., Chicago Heights — POWER PLANT — Hunter Co., engrs., 608 South Dearborn St., Chicago, taking bids boilers, turbines, pumps for power plant, for Diamond Braiding Mills.

N. H., Hinsdale — PAPER MILL — Hinsdale Paper Mfg. Co., L. D. Stearns, treas., Hinsdale (White-Washburne Co., Inc.), taking bids rebuilding 3 story, basement, 75x180 ft., concrete, brick, steel paper mill, Main St. $100,000 or more. McClintock & Craig, 458 Bridge St., Springfield, Mass., archts.

N. Y., Brooklyn—FACTORY—See "Contracts Awarded."

N. Y., Jamaica — GARAGE, SERVICE STATION, etc.—See "Contracts Awarded."

N. C., Greensboro — PLANT — Apr. 14, by Mock-Judson-Voehringer Mfg. Co., J. K. Voehringer, pres., constructing large addition to hosiery plant. To exceed $200,000. Will spend $200,000 for new machinery.

CONTRACTS AWARDED

Calif., Los Angeles — FACTORY — Federated Metals Corp., 2435 Hunter St., 80x140 ft. and 80x240 ft. factory buildings, to Austin Co. of Calif., 777 East Washington St. Est. $100,000. Noted Feb. 24, C. D.—Feb. 27, E. N.-R.

Calif., Oakland — FACTORY — Owens-Illinois Pacific Coast Co., 1855 Folsom St., San Francisco, excavation for glass factory, Alameda and Fruitvale Aves., to Heafey-Moore Co., 344 High Wks. Co., about $16,380. Noted Mar. 26, C. D. —Apr. 2, E. N.-R.

Calif., San Bernardino—MARKET—W. W. Oswald, 1 story, 80x127 ft., rein.-con. market, west side of E St., to Bakker & Robinson, 732 D St. Est. $60,000. H. E. Jones, 518 Anderson Bldg., archt.

Calif., Santa Monica — FACTORY — Douglas Aircraft Co., 9000 Ocean Park Blvd., concrete work for new 300x300 ft. manufacturing unit to be added to the west side of company's plant, 9000 Ocean Park Blvd., to Harman & Co., 3044 Riverside Dr., Los Angeles, approximately $65,000. Taylor & Taylor, 803 West 3rd St., Los Angeles, engrs. and archts. Noted Feb. 21, C. D.—Feb. 27, E. N.-R.

Conn., Bridgeport—PLANT—United Illuminating Co., 84 Temple St., New Haven, 1119 Broad St., foundations for 1 story, 62x110 ft., brick, steel, concrete boiler plant, East Main St., to C. W. Blakeslee & Son, Inc., 58 Waverly St., New Haven***steam generators, to B. and W. Transformer Co., 60 Beaver Rd., Jamaica, N. Y.***piping, to M. W. Kellogg Co., 225 Broadway, New York***combustion, to Public Flow Meters Co., 101 Park Ave., New York***fired pumps, to Ingersoll Rand Co., 11 Broadway, New York***deaeration, to Elliott Co., 225 Broadway, New York***ash handling, to United Conveyors Corp., 101 Park Ave., New York***ash eliminators, to Research Corp., 405 Lexington Ave., New York***coal scales, to Richardson Scale Co., 17 John St., New York ***fans, to Sturtevant Co., West Farms Rd. and 176th St., New York. General contract, coal handling, main pipe and coverings to be awarded. Noted Mar. 31, C. D.

Conn., Bridgeport—FACTORY—Edwin Moss & Son, Inc., general contractors, 729 Union Ave., reinforcing steel for 1 story, 90x200 ft. factory addition, to Truscon Steel Co., 42 Church St., New Haven, for Hemco Division, Bryant Electric Co., 1421 State St., H. E. Seim, genl. mgr. ***iron, to Leake & Nelson, 203 Ash St.*** finish, to A. W. Burritt Co., 415 Knowlton St. ***roofing, to Barrett Roofing & Supply Co., 112 Read St. Bids soon for electrical work. Noted Mar. 24, C. D.—Mar. 26, E. N.-R., under "Contracts Awarded."

Conn., New Haven—WAREHOUSE—P. Ballantine & Co., Inc., Newark, N. J., steel for 1 story, 62x151 ft., brick, steel, concrete beer distributing plant, to Berlin Constr. Co., Berlin. Total est. $40,000. Noted Mar. 17, C. D.—Mar. 19, E. N.-R., under "Contracts Awarded."

Ga., Atlanta—GARAGE and STORE—G. W. Collier Est., Collier Bldg., 1 and 2 story, 100x130 ft., rein.-con., steel garage and store, to Barge Thompson Co., 136 Ellis St. N.E., $40,941. F. P. Smith, Norris Bldg., archt.

Ill., Chicago—BREWERY—Peter Fox Brewing Co., 2606 West Monroe St., 4 story, basement, 100x125 ft. brewery, 2606 West Monroe St., to R. C. Wiebolt Constr. Co., 1412 West Washington Bldg., $200,000. Awarded Mar. 20, R. Griener & Sons, 64 West Randolph St., archts.

Ind., Gas City—WAREHOUSE—Owens-Illinois Glass Co., Alton, Ill., T. A. Collins, local mgr., Gas City, 2 story, 50x100 ft. warehouse addition to glass plant, to Austin Co., 510 North Dearborn St., Chicago, Ill., $75,000. Bids Mar. 30, awarded Mar. 30. Private plans.

Ind., Muncie—PLANT—Owens Illinois Glass Co., Macedonia Ave. at 9th St., W. P. Zimmerman, pres., constructing 1 plant for making Insulex glass blocks; also Plant 1 addition, incl. glass furnace, ovens and storage space, to Simplex Eng. Co., Washington, Pa. Est. $35,000 or more with machinery. Noted Feb. 24, C. D.—Feb. 27, E. N.-R.

Me., Portland—BAKERY—Cushman Baking Co., 107 Elm St., general contract 2 story, basement, brick, concrete bakery addition, Elm and Lancaster Sts., to Goozins & Clark, 46 Portland St., to exceed $37,000. Awarded Mar. 30. Noted Feb. 20, C. D.—Feb. 27, E. N.-R.

Mass., Cambridge — FACTORY, etc. — L. C. Blake, general contractor, 50 Dyer Ave., Milton, steel erection factory and office building addition, to N. P. Bergman, 97 Warren Ave., Milton, for Dewey & Almy Chemical Co., 235 Harvey St.***plumbing, to F. T. McDonald, 103 A Franklin St., Brighton***electrical work, to Balcom Bros., 29 Irving St., Malden***excavation, to Jeremiah Sullivan Sons, 23 Willard St., Cambridge***reinforcing steel, to Avery & Saul Co., 297 Dorchester Ave., South Boston ***structural steel, to A. O. Wilson Structural Co., 40 Smith Pl., Cambridge***stone, to Bianchi Cast Stone Co., 338 Copeland St., Quincy***roofing, to Eagle Cornice & Skylight Wks., 197 Sidney St.***insulation by general contractors***heating by owners. Noted Mar. 20, C. D.—Mar. 26, E. N.-R., under "Contracts Awarded."

Mass., Salem—FACTORY—Hygrade Sylvania Corp., 60 Boston St., heating for 2 and 3 story, basement, 60x120 ft., 60x80 ft. and 40x80 ft. factory, Loring Ave., to V. J. Kenneally Co., 251 Causeway St., Boston. Noted Feb. 20, C. D.—Feb. 27, E. N.-R., under "Contracts Awarded."

Mass., Salem—FACTORY—Leslie R. Porter Co., general contractors, 156 Stuart St., Boston, light iron for factory, Loring Ave., for Hygrade-Sylvania Corp., 60 Boston St., to E. Van Noorden Co., 100 Magazine St., Roxbury***painting, to Newton Marshall Co., 522 Harrison Ave., Boston***maple floors, to Mardi Flooring Co., 5 Union St., Somerville***fire escapes, to Everett Iron Wks. Co., 31 Orient Ave., Everett. Noted Apr. 3, C. D.

Mo., St. Louis—FACTORY—Gamble Constr. Co., general contractors, 620 Chestnut St., steel sash and reinforcing steel, for 2 story, 120x173 ft., rein.-con., brick factory addition, Penrose St., West of Kingshighway Blvd., for Cupples-Hesse Envelope & Lithographing Co., 4173 North Kingshighway, to Truscon Steel Co., Mart Bldg.***iron work, to Atlas Iron Wks., 4020 Geraldine St.***partitions, to H. Goltermann, Louderman Bldg. Noted Mar. 10, C. D.—Mar. 12, E. N.-R., under "Contracts Awarded."

N. Y., Brooklyn—FACTORY—Adzan Realty Corp., L. Greenburg, pres., 114 North 6th St., Brooklyn, 2 story factory, 92 North 4th St., separate contracts and day labor. $45,000. J. Furman, 6919 Groton St., Forest Hills, archt.

N. Y., Brooklyn—STORAGE—F. and N. Schaefer Brewing Co., 430 Kent Ave., 3 story brick, storage, 440 Kent Ave., to White Co., 95 Madison Ave., New York, General contract or awarded contract for 185 tons structural steel, to Norton Steel Co., 103 Park Ave., New York. Noted Feb. 26, C. D.—Mar. 5, E. N.-R.

N. Y., Jamaica—GARAGE, SERVICE STATION, etc.—Kollman Realty Co., 151st St. and Archer Ave., constructing 1 story, brick garage, shop and service building, 150th St. and Archer Pl., separate contracts. Est. about $50,000 with equipment. A. MacLean, c/o owner, archt. Noted Mar. 4, C. D.—Mar. 12, E. N.-R.

N. Y., New York—Forty-Nine Duane Realty Corp., 1860 Bway., constructing 2 story, garage and showroom, 49 Duane St., separate contracts awarded. $85,000. G. G. Miller, 10 East 49th St., archt. Noted Mar. 4, C. D.—Mar. 12, E. N.-R.

N. Y., Niagara Falls—WAREHOUSE, etc.—John Smith & Son, general contractors, 3420 Highland Ave., structural steel for warehouse and paint shop, to Bethlehem Steel Co., Ohio and Abby Sts., Buffalo, for Krueger Motor Sales Co., 835 Winslow Ave. Noted Mar. 23, C. D.—Mar. 26, E. N.-R., under "Contracts Awarded."

N. Y., Niagara Falls—FACTORY—Carborundum Co., Buffalo Ave., general contract, heating, plumbing, etc. for Factory Building 36-A, Buffalo Ave., to Wright & Kremers, Inc., Pine Ave. and Main St. Private plans.

N. Y., Niagara Falls—CARBON PLANT—Moore Research & Service Co., Inc., United Office Bldg., general contract plant addition, Highland Ave., to Wright & Kremers, Inc., Main St. and Pine Ave., Niagara Falls; electrical work, to Steele Electric Equipment Co., 903 Oxford Ave., Niagara Falls. General contractor will purchase three 125 hp. low pressure boilers and elevator. Noted Mar. 3, C. D.—Mar. 5, E. N.-R.

N. Y., Niagara Falls—WAREHOUSE, etc.—John Smith & Sons, general contractors, 3420 Highland Ave., reinforcing steel for warehouse and paint shop, Pierce Ave., for Kruger Motor Sales Co., 835 Winslow Ave., to Recon, Inc., 154 West Huron St., Buffalo***roofing, to Connor Roofing & Asbestos Co., 8th St. and Pine Ave. Est. $40,000. Noted Mar. 30, C. D.—Apr. 2, E. N.-R.

N. Y., Syracuse—STORAGE, etc.—Dawson Bros. Constr. Co., general contractors, Union Bldg., Syracuse, structural steel for storage building, Teall Ave., for International Harvester Co., 606 South Michigan Ave., Chicago, Ill., to Empire Structural Sales, 445 South Warren St. Noted Feb. 21, C. D.—Feb. 27, E. N.-R., under "Contracts Awarded."

N. C., Greensboro—PLANT—Vick Chemical Co., constructing 2 story, brick addition to chemical plant, laboratory alteration and air conditioning, Wendover Ave., to Geo. W. Kane, Greensboro, about $37,000. Noted Mar. 6, C. D. —Mar. 12, E. N.-R.

N. C., Ossippi — MILL — Burlington Mills, Burlington, constructing 1 story, 116x120 ft. rein.-con. mill, to Chas. W. Angle, Inc., Greensboro.

O., Dayton—POWER PLANT—United Engineers & Contractors, Inc., general contractors, 1401 Arch St., Phila., Pa., excavation for power plant, for Dayton Power & Light Co., 20 South Jefferson St., to Finke Eng. Co., 116 South Perry St., $7,000***concrete for footings, pits, to C. Shook, Inc., 582 West 2nd St., $20,000. Noted Mar. 11, C. D.—Mar. 19, E. N.-R., under "Contracts Awarded."

Pa., Erie—STORAGE—Water Comrs., J. S. Dunwoody, supt., 1 story, 80x157 ft., steel frame, rein.-con. brick storage building addition to repair shop, to E. E. Austin, Reed and 20th Sts., $46,480. A. K. Hubbard, 703 French St., engr.

★ **Pa., Homestead**—PLANT—Mesta Machine Co., Homestead, plant additions and extensions, separate contracts awarded. Est. $750,000 incl. equipment.

Tex., Houston—SERVICE STATIONS—Gulf Refining Co., Gulf Bldg., reconditioning 20 or more service stations, separate contracts now being awarded. Est. $100,000. Private plans.

Wash., Hoquiam—PLYWOOD PLANT—West Coast Plywood, Becker Bldg., Aberdeen, constructing boiler house for plywood plant, to McManama & Co., Arctic Bldg., Seattle, Awarded Mar. 30. Total est. $300,000. C. W. George, Becker Bldg., archt. Noted Apr. 2, C. D.—Apr. 9, E. N.-R., under Contracts Awarded.

★ **Wash., Hoquiam**—PLYWOOD PLANT—A. R. Wuest, 303 West 9th St., Aberdeen, constructing plywood plant on waterfront, pile driving only, to Grays Harbor Constr. Co., 609 H St. Total est. $500,000. C. W. George, Becker Bldg., Aberdeen, archt. Noted Mar. 13, C. D.—Mar. 19, E. N.-R., under "Washington."

Ont., Goward — SMELTER — J. C. Krumm, engr., 515 Harbor Comm. Bldg., Toronto, furnishing, erecting structural steel for 1 story 25x60 ft., steel, corrugated sheathed smelter building, plain found., for Cuniptan Mines Ltd., 301 Dominion Bldg., 465 Bay St., Toronto, to John T. Hepburn Ltd., 18 Van Horne St., Toronto; furnishing corrugated iron sheathing to Pedlar People Ltd., Oshawa. Owner's force applies it and does all labor except on steel frame. Prices and information wanted on 2,000 ton per day gravity jig concentrator, by engineer at mine. Noted Mar. 13, C. D.—Mar. 19, E. N.-R.

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†*Federal Government.*